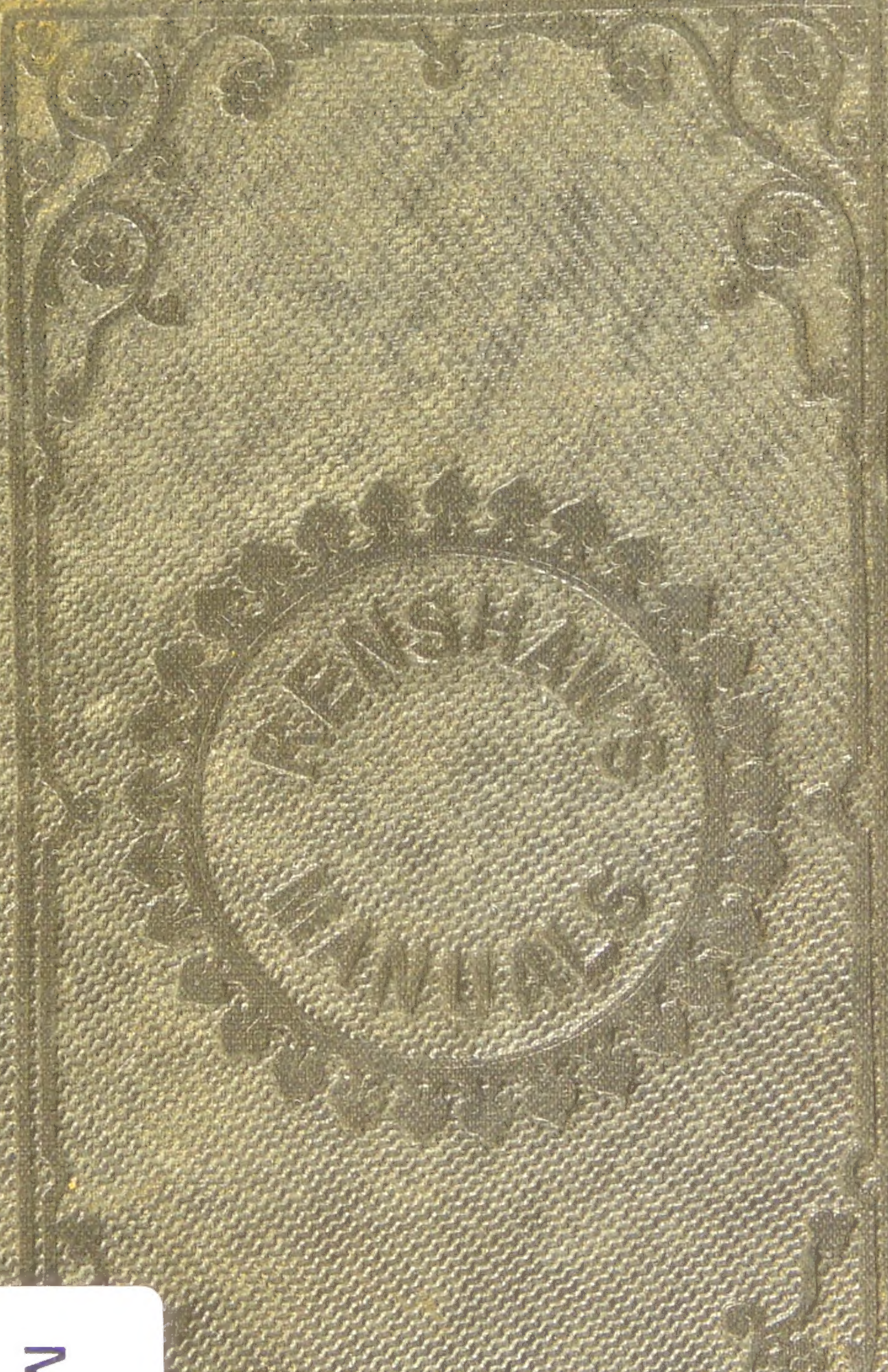

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HOOPER'S

PHYSICIAN'S VADE MECUM:

A Manual of the Principles and Practice of Physic;

WITH AN OUTLINE OF GENERAL PATHOLOGY,
THERAPEUTICS, AND HYGIÈNE.

EIGHTH EDITION.

REVISED

BY

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EDITORS' PREFACE.

THE original work of Dr. Hooper, published in 1823, was so successful, and passed through so many editions, as to induce the proprietors to place it in the hands of successive Editors, by whom it was improved and enlarged.

From his Preface, it appears that the object he contemplated was to furnish a concise treatise on the practice of medicine for the use of Student and Practitioner. After his death an Introductory Part was added, containing a short outline of Physiology, Pathology, and Therapeutics, some brief directions for Clinical Examination, and a sketch of Symptomatology and Semeiology. This, which did not occupy more than sixty-five pages, was entirely re-written in the first edition entrusted to Dr. Guy, who is mainly responsible for the additions and alterations made in this part in all the subsequent editions; while Dr. Harley is now similarly responsible for the matter contained in the second part. Both parts have been largely illustrated by engravings.

The general aim and scope of the work is fully explained in the Introduction.

In making the extensive changes and additions above indicated, the original intentions of the Author, to make this work practically useful to the Student and Practitioner, have been strictly adhered to, and we believe it will now be found the most comprehensive work of the kind hitherto published in this country.

Many original observations and practical remarks, embodying the results of Dr. Harley's experience, are contained in the text of the second part. Those contributed by Dr. Guy to former editions are distinguished by the initial G.

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November, 1868.

PART I.

GENERAL PATHOLOGY AND THERAPEUTICS.

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INTRODUCTION.

THIS book is intended to be, in the largest sense of the term, a practical work; that is to say, it aims at bringing together, in a small compass, and in a form easy of reference, those items of information which the practitioner would wish to possess when he stands at the bedside, or when he studies a case with a view to its treatment.

The first and most obvious requisite for a practitioner is to be able to recognise a disease when he sees it, to distinguish it from others that resemble it, and to foretell its probable course and termination. The treatment he adopts will be judicious in proportion to the certainty with which he recognises, and the accuracy with which he discriminates, diseases; and will be either rational or empirical, according as he does or does not understand their real nature and true cause.

But a facility of recognising and discriminating diseases, a knowledge of their nature and causes, of their ordinary course and termination, and of their appropriate treatment, though essential to sound and successful practice, are not the only qualifications for it. There is a vast amount of information of a truly practical character, which does not find a place in formal descriptions of individual diseases, though comprising all these particulars. Such descriptions must be regarded either as condensed histories of the more perfect forms of disease, or as abstracts of the leading features observed in the ordinary run of cases, with an occasional notice of the more remarkable exceptions to the rule; but age, sex, and original and acquired peculiarity of constitution, give rise to differences in health, or habitual departures from it, which remarkably affect the severity and even the character of diseases. Hence a knowledge of the mode and degree in which both health and disease are affected by difference of age and sex, and of constitution, whether original or acquired, is not less essential to safe and successful practice than is a special description of diseases themselves.

The list of the necessary acquirements of the practical physician, however, is not yet complete. It often happens that, at the bedside, great importance attaches to an individual symptom, and questions occur in relation to it, which are not, and cannot be, answered in the short space devoted to the description of the disease of which it forms a part. The symptom may be common to several diseases, or it may be a question whether, though assumed to be a symptom of disease, it be not compatible with health. Moreover, there are many symptoms or signs of disease which are detected only by very close examination, and by the use of instruments or of chemical tests; and in using these instruments and applying these tests, many precautions are necessary that are not easily borne in mind, and with regard to which the practitioner may often require to refresh his memory.

One other consideration suggests itself in this place. No man, whatever his pursuit, deserves the name of a practical man whose knowledge and resources are limited by the experience of those who have gone before him. In all employments, and in none more than in the practice of medicine, new events and rare combinations are continually presenting themselves, which can only be understood and successfully encountered by the aid of general principles. Hence the necessity for the physician of a knowledge of pathology and therapeutics, which supply the general principles that are to guide him in treating cases of disease, or complications of which he has no previous experience.

A physician who is well versed in all these particulars may lay claim to the title of *learned* in its best sense: if he have made this knowledge his own by diligent observation at the bedside, and by the constant use of instruments and application of tests, by which alone the value of symptoms can be determined, he will have earned for himself the name of *experience*; and if to learning and experience he unite the faculty of prompt and ready use of the knowledge he has acquired, he is truly a *practical physician.*

A very wide and comprehensive meaning is here given to the terms *learning* and *experience*, and to the phrase *practical physician.* Indeed, it is of the first importance that these words should not be used in a low and vulgar sense. It is too much the custom to call a man a practical physician because he gives no time or attention to anything but the routine duties of his profession; and to deny him that title if he devote his leisure to what are called scientific pursuits, even though those pursuits should be in immediate connection with, and have a direct bearing upon, practice. A strong conviction that no man is truly practical who is not also possessed of an extensive scientific knowledge of his profession, has presided over the preparation of this work, and has induced the Editors to extend it beyond the limits usually assigned to a so-called practical treatise.

In order fully to carry out the practical views here indicated, this work is divided into two distinct parts, of which the first embraces, in a connected form, those more general considerations that make up the sciences of General Pathology and Therapeutics, while the second contains, in a form easy of reference, a description of diseases, their diagnosis and prognosis, their rationale, and their treatment, or what is usually known as the Theory and Practice of Medicine.

The First Part is divided into six chapters, under the following titles:—1. *Health and Disease*, comprising such general observations upon either as seem to have the most practical bearing; pointing out the way in which both are varied by age, sex, temperament, and mode of life, and concluding by an explanation of the terms in common use for distinguishing diseases from each other, and giving precision to our views and statements concerning them.—2. *Causes of Death.* In this chapter some of the leading facts that have been ascertained in reference to the causes of death are brought together with a view of giving to the student and practitioner some idea of the relative frequency and importance of the diseases which prove fatal to human life.—3. *Outline of Physiology and General Pathology.*—In this chapter those facts and theories which have the most direct bearing upon the practice of medicine are brought together, and briefly stated, all unnecessary discussion being carefully avoided, and the more important and minute details being reserved for—4. *Examination of some of the more important Symptoms and Signs of Disease*, comprising the Urine, the Viscera of the Abdomen and of the Chest, the Pulse, and the Respiration. Chapter 5 treats of Hygiène, private and public; while Chapter 6 contains *An Outline of General Therapeutics*, comprising such general principles as have been laid down for the preservation and improvement of health and the treatment of disease, together with an account of the principal remedies, and of their mode of operation.

The Second Part, or the Practice of Medicine, properly so called, is also distributed into chapters as follows :—1. States of the System, as distinguished from diseases properly so called.—2. Local Diseases, affecting all or several of the organs or textures of the body.—3. Febrile Diseases without essential local complication.—4. Febrile Diseases with essential local complication.—5. Febrile Diseases arising from local causes.—6. General Disease (not febrile), with essential local complications.

The remainder of the diseases are distributed into ten chapters, as follows :—1. Diseases of the Nervous System.—2. Diseases of the Organs of Circulation.—3. Diseases of the Organs of Respiration.—4. Diseases of the Organs of Digestion and Abdominal Viscera.—5. Diseases of the Urinary Organs.—6. Diseases of the Organs of Generation.—7. Diseases of the Organs of Sense.—8. Diseases of the Skin and its Appendages. 9. Parasitic Animals; and 10. Poisons, followed by a list of antidotes to the principal poisons.

The Second Part is brought to a close by an extensive collection of Formulæ, preceded by classified lists of the preparations of the Pharmacopœia, with their doses.

Glossarial and general indices complete the volume.

THE
PHYSICIAN'S VADE MECUM.

CHAPTER I.

HEALTH AND DISEASE.

1. HEALTH has been defined as the integrity of every structure, and the perfect, harmonious play of every function of the living body; and some writers have indulged in long descriptions of it, more remarkable for elegance of diction than utility. Perfect health is as rare as extreme old age, and, like perfect beauty, is an ideal hard to describe, and compounded of the perfections of many different individuals.

2. In strict propriety of language, perhaps there is but one condition of the body to which the term 'health' can be applied, all others being deviations, more or less wide, from that condition; but for practical purposes, it is well to understand that there may be departures from the standard of perfect health, to which, nevertheless, the terms disorder or disease would be inapplicable.

3. That health is a condition admitting of degrees is shown by the familiar use of such terms as '*good*,' '*perfect*,' '*strong*,' '*vigorous*,' '*robust*,' '*feeble*,' '*delicate*'—differences generally recognised, not only as belonging to the same person at different times, and at different periods of life, but also as distinguishing one individual from another.

4. But besides these differences in degree there are differences in kind, corresponding more or less closely to peculiarities of external form, and indicating a tendency to particular diseases, or to a peculiar character attaching to all the diseases to which the person may become subject. These differences have long been recognised as *Temperaments*—a word wanting in precision, but, like many others current among medical men, embodying a useful generalization.

5. Four temperaments are generally recognised—the *sanguine*, the *phlegmatic*, the *bilious*, and the *nervous*.

6. The *sanguine* temperament is characterised by moderate plumpness of person and firmness of flesh. The hair is red or light chestnut, the eyes blue, the complexion fair and florid, the skin soft and thin, the circulation active, the pulse full and frequent, the countenance animated, the movements quick, the passions excitable, the mind volatile and unsteady.

7. The *phlegmatic* or *lymphatic* temperament is distinguished by roundness of form and softness of flesh. The hair is fair, the eyes light blue, gray, or hazel, the skin pale, the lips large, and the face wanting in character and expression. The circulation is languid, the pulse slow, and all the functions, bodily and mental, are torpid.

8. The *bilious* temperament is recognised by firmness of flesh, harsh outlines of the person, and strongly-marked and expressive features. The hair and eyes are dark brown or black, and the complexion swarthy. The superficial veins are prominent, and the pulse is full, firm, and of moderate frequency. There is much energy of character, with great power of endurance physical and mental, and permanence of impressions. When the mind is unusually serious and sad, this is called the *melancholic* temperament.

9. The *nervous* temperament is distinguished by a small spare form, with soft and slender muscles. The features are delicate, the hair fair, and the complexion pale or slightly tinged with red; the lips thin, and the eyes light and sparkling. The pulse is small, frequent, and quick, and easily excited by emotion. The senses are acute, the thoughts and movements quick, and the imagination lively.

10. Pure specimens of these temperaments are rare. In most persons two, or even more, are found combined, and these combinations are known as *mixed* temperaments. Thus we may have a *nervous-lymphatic*, or a *sanguine-bilious* temperament, the nervous element preponderating in the first, the sanguine element in the last. In some instances the leading characteristics of the two temperaments are so distinct, that we have no difficulty in recognising them; but they may be so blended as to make it hard to say which predominates. We may also encounter in the purest specimens exceptions to the rule; such as a pulse of 50 in a youth with all the outward marks of the sanguine temperament.

11. Each of these temperaments predisposes to its own class of diseases,—the sanguine, to acute inflammation and active hæmorrhage; the phlegmatic, to congestions and subacute inflammations, to glandular and tubercular diseases; the bilious, to disorders of the digestive organs, with depression of spirits; and the nervous, to undue mental excitement.

12. Among the peculiarities of form and appearance which combine to constitute the temperaments, there are some that claim attention as indications of strength or weakness. Thus, *cæteris paribus*, the large chest is an indication of vigour; the small chest, of weakness; the thin

lip, marked features, and small joints, of tone; the full upper lip, rounded form and features, and large joints, of constitutional debility.

13. There are other combinations again which prevail among persons subject to certain diseases or classes of disease, and these are known as *Diatheses.* For instance, a fair complexion, fine hair of different shades from light to dark chestnut, a blue or gray eye, and long eyelashes, with a thick upper lip, form a combination very frequent in scrofulous persons; and the same combination, the thin upper lip being substituted for the thick, is as common in consumptive patients. The one may be termed the *strumous* or *scrofulous*, the other the *phthisical* or *consumptive* diathesis. They are probably one and the same diathesis, slightly modified.

14. The term *diathesis* is also used to designate the character of constitution of persons in whom the urine presents certain peculiarities. Hence the terms *oxalic acid*, *lithic acid*, and *phosphatic diathesis*, applied to persons whose urine yields oxalate of lime, lithic acid and its salts, and phosphoric acid and its salts, in excess, accompanied by other marks of impaired health.

15. These peculiarities which, under the names of temperament and diathesis, distinguish one man from another, may be transmitted from parent to child, and are then said to be due to *Hereditary Predisposition.*

16. This hereditary predisposition shows itself in the marked resemblance of children to parents or ancestors. Sometimes the very temperament or diathesis of one or other parent is reproduced, coupled with a close resemblance of form and feature; but, in most instances, the resemblance is limited to some strongly-marked feature, deformity, or peculiarity of taste, temper, or talent, which may even be transmitted through several generations. Such hereditary transmissions have been recognised in the royal families of Europe. In ancient Rome, the mild humanity of the Gracchi, the severity of the Catos, and the cruelty of the Claudian race; in France, the factious rashness of the Guises, and the irritable and unbending character of the family of Mirabeau; and in England, the vigorous intellect of our Gregorys, Herschels, and Pitts, furnish examples of the transmission of virtues, vices, and talents. Supernumerary toes and fingers, and certain defects in the organs of generation, may be cited as instances of hereditary deformity.

17. Hereditary predispositions to disease are also of common occurrence, and in extreme cases all or several children of a marriage become subject, at or about the same age, to a particular infirmity, such as blindness, or fall victims to some fatal disorder, such as pulmonary consumption. The diseases most frequently traced to this cause are scrofula, consumption, gout, epilepsy, insanity, cancer, and asthma; and stone, gravel, and other urinary disorders, some cutaneous diseases, and hæmorrhoids may be added to the list. On the other hand, a sound

constitution, and a frame destined to last to a very advanced age, are blessings often handed down through several generations.

18. Certain families, again, display a special liability to infectious maladies, such as typhus fever, scarlatina, whooping-cough, measles, and diphtheria, and an equally special mortality. As these acute and fatal seizures occur not in any one epidemic, or in one spot, but in different epidemics, at long intervals, and in places remote from each other, it is reasonable to attribute them to some common character in the persons attacked; in other words, to *family constitution.*

19. Hereditary diseases, as distinguished from hereditary tendencies to disease, are comparatively rare. Few children, for instance, are born with tubercles in the lungs, or with apoplexy.

20. A peculiarity of form, character, or morbid tendency, has been known to disappear in one generation, to appear again in the next. This form of hereditary predisposition has been termed *Atavism.*

21. Hereditary diseases or predispositions to disease may be transmitted without any fault or imprudence on the part of parents. But children are often born into the world of infirm constitution and prone to disease, in consequence of circumstances referable to the marriage of the parents, such as extreme youth or advanced age, great disparity of age, or too close alliance in blood.

22. The habitual state of health of the parents, or even their state of health at the time of conception, and that of the mother during pregnancy, may also determine the constitution of the offspring; and there is reason to believe that the syphilitic taint in a parent is a cause of debility and a source of disease to his children.

23. The facts just stated with respect to hereditary predisposition are confirmed by observations on animals, which exhibit its effects not only in their outward form but also in their instincts and habits; and Dr. Brown-Séquard has even found that guinea-pigs are subject to epileptic seizures similar to those which had been artificially induced in the parent animal by certain injuries to the nervous centres.

24. Among the morbid states that have been by general consent traced to hereditary taint, the most important is *scrofula.* It consists in the deposit of a peculiar material in the glands of the neck, and of the mesentery; in the substance of the lungs, liver, and kidneys; in the membranes of the air-passages, intestines, brain, and spinal cord; which material may stir up inflammation and lead to important structural changes, and so become the source of several lingering and wasting maladies. This morbid deposit appears to acknowledge as its principal cause a certain weakness and unsoundness of constitution, which, after giving rise to one disease in the parent, may show itself in his offspring in different forms. A man who has attained an advanced age after suffering all his life from epilepsy, may see his children afflicted—one with scrofulous enlargements and ulcers of the neck, a second with

tabes mesenterica, a third with pulmonary consumption, a fourth with white swellings of the joints and destruction of the bones of the spine, and a fifth with unsoundness of mind.

25. An important practical inference may be drawn from what has been stated concerning temperaments, diatheses, and hereditary predispositions—namely, that we shall encounter at the bedside a vast variety of constitutions, and many degrees of vigour, by which our treatment of disease must needs be influenced and modified. Hence it is an advantage to a patient that his physician should know his constitution; but this advantage is often estimated too highly, and cannot compensate for a very moderate superiority in education, experience, or skill.

26. Temperament, diathesis, and hereditary predisposition, then, constitute the most marked differences between man and man; but there are others of more rare occurrence, and limited to comparatively few individuals, which are known as *Idiosyncrasies.*

27. Of these there are three kinds. The first consists in an extreme susceptibility, or the reverse, to the action of certain medicines; as when one person is salivated by a single small dose of a mild preparation of mercury, while another will resist a long course of the same remedy in its strongest form. The second kind consists in the production of poisonous effects by the most common articles of diet; as when fish, fruit, vegetables, and meat, usually accounted perfectly wholesome, occasion marked disorder of the digestive organs, accompanied sometimes with painful cutaneous eruptions. The third class consists in the inversion of the characteristic effects of medicines; as when opium acts as an aperient, and common Epsom salts as a narcotic. A class of mental idiosyncrasies might be added, consisting in strange preferences or aversions for objects usually deemed indifferent.

28. The differences arising from temperament, diathesis, hereditary predisposition, and idiosyncrasy, may exist between males or females of the same age; but other and very important differences depend upon sex and age.

29. *Sex.*—The constitution of men differs from that of women; in disease as well as in health. In the constitution of the male there is more tone and strength, and in the structure of his body, more rigidity; hence a greater proneness to inflammatory affections and active hæmorrhages; females, on the other hand, have more sensibility and excitability, and a more lax and delicate fibre, with a strong tendency to nervous affections and to diseases of an asthenic character. The functions of menstruation, parturition, and lactation, also exercise a marked influence on the health of the female, especially in the production of disorders of the circulation and nervous system.

30. The diseases of men, taken one with another, are more fatal than those of women; men are also more exposed to accident and violence, and fall in greater numbers into habits of intemperance. Hence the

lower rate of mortality of females, their greater longevity, and the excess of women among the living population.

31. This difference in the rate of mortality of males and females obtains at every period of life except the interval from 15 to 35, when the deaths of females are in excess, and the intervals from 5 to 10 and 35 to 45, when the numbers are equal; and it even shows itself in infancy, when sex might be supposed to have least influence. Male children under 5 years of age die at the rate of 73, but female children at the lower rate of only 63 in the thousand.

32. The most important practical consideration connected with sex is, the greater liability of males to inflammatory and sthenic diseases, and of females to asthenic and nervous disorders; so that, as a general rule, if a male and female are attacked by the same disease, the former will bear depletion and lowering remedies better than the latter.

33. *Age.*—There are several important practical considerations connected with age. In infancy, we have to bear in mind the gradual, and often imperfect, establishment of the function of respiration, and the consequent necessity of external warmth; in early childhood the disturbance produced by teething; and throughout infancy and childhood, the liability to disorders of the stomach and bowels on the one hand, and of the brain on the other. Diarrhœa, infantile fever, abdominal consumption, intestinal worms, and scrofulous affections of the absorbent glands, result from the activity of the organs of digestion and assimilation; white swellings and scrofulous diseases of bone, from the active growth of the organs of locomotion; convulsions and hydrocephalus, from the large development and vascular condition of the brain. Inflammation of the lungs, often connected with their imperfect expansion, and the febrile exanthemata (partly traceable to the fact that the first exposure to their contagions must occur during these early periods of life) complete the list of the more frequent and fatal diseases of infancy and childhood.

34. As childhood passes into youth, the disorders of the alimentary canal become less frequent and fatal, and react less severely on the nervous centres. Intestinal irritation ends less frequently in abdominal consumption and water on the brain; and in lieu of the convulsions of infancy, we encounter the more curable involuntary movements of chorea.

35. Puberty, which occurs in either sex about the age of 14, entails familiar changes, physical and mental; and, on women, the peculiar function of menstruation. The advent of these changes is often postponed for a few years, during which women are subject to disorders dependent on the imperfect establishment or complete suspension of the menses. Of these disorders anæmia is the most common; but chorea and epilepsy, melancholia, and instinctive mania attest its occasional influence on the nervous system.

36. The disproportion between the head and abdomen and the rest

of the body lessens as age advances, and by the twenty-first year the frame assumes its due proportions. By the twenty-fifth year, or a little later, it attains its full growth. In this period of youth disorders of the alimentary canal and of the nervous system are rare, but febrile and inflammatory affections are common; and scrofula, which had shown itself in the form of enlarged glands of the neck, white swellings of the joints, and abdominal consumption, now takes the shape of consumption of the lungs.

37. From the twenty-fifth to about the forty-fifth year, the body remains nearly stationary, but with an increasing disposition to corpulency. During the first part of this period, febrile and inflammatory affections, and pulmonary consumption, are rife; but towards the fiftieth year, congestion and slow degeneration of the tissues of important organs take the place of inflammation, and apoplexy is henceforth a common and rapidly-increasing cause of death. In women, the interval from forty to fifty, with the years preceding and following, is marked by the cessation of the menstrual discharge, and the strange nervous affections which often accompany the 'change of life.'

38. From fifty to sixty years, the body begins to show signs of loss of power and sluggishness of function, the prelude to that slow decay of which the progress is indicated by diminished sensibility, impaired memory, muscular weakness, scanty secretions, calculous affections, osseous deposits, and organic visceral disease.

39. From this enumeration of the diseases prevailing among persons at different ages, it will be inferred, that the risks to which they are exposed, as measured by their mortality, differ considerably; to what extent the following statement will show:—The period most fatal to life is the first year, during which one-fourth of all the recorded deaths takes place. During the four succeeding years, also, the number of deaths is so considerable, that the 25 per cent. of the first year becomes for the first five years 42 per cent. By the completion of the fifteenth year, this proportion is increased to nearly one-half. During the forty years from 15 to 55, rather more than a fourth of all the deaths takes place, each decade contributing in nearly equal proportion to the aggregate result. At 55 years three-fourths of the population have succumbed. From 55 to 85, 23 deaths in the hundred, or nearly another fourth, takes place; the ten years from 65 to 75 being the most fatal. Two per cent. of the entire mortality is accounted for by the deaths after 85 years of age. A small number of healthy and vigorous persons of either sex reach, or even surpass, the age of 100, and a still smaller number are believed to have attained or exceeded a century and a half. The following is a condensed view of the distribution of the deaths according to age:—

Under 1 year, 25 deaths in 100, or 1 in 4.
„ 5 years, 42 „ „ „ more than 2 in 5.
„ 15 „ 49 „ „ „ nearly 1 in 2.
„ 55 „ 75 „ „ „ 3 in 4.

Or, if the whole mortality is distributed into four equal parts, it will take place in unequal times, thus:—

Under 1 year	one-fourth.
1 to 15 (14 years)	one-fourth.
15 to 55 (40 years)	one-fourth.
55 and upwards	one-fourth.

40. These figures show the deaths registered at the several ages; but as the number living at each age differ greatly, they do not display the true risk to which persons of different ages are subject. This is shown in the following table, both for males and females.

Out of 1000 males and 1000 females living in England at each age, the deaths placed opposite to those ages occur, one year with another, among the English population—

Ages.	Males.	Females.	Ages.	Males.	Females.
Under 5	74	63	35 to 45	13	13
5 to 10	9	9	45 „ 55	19	16
10 „ 15	7	5	55 „ 65	32	29
			65 „ 75	68	61
5 „ 15	7	7	75 „ 85	150	137
15 „ 25	8	9	85 „ 95	303	281
25 „ 35	10	11	95 and upwards	452	452

41. The figures which represent the rate of mortality of females show a curious approach to regularity of increase in the five decades from 5 to 55, and in the six from 45 to the end of life; the mortality in the first series being nearly as the numbers 7, 9, 11, 13, 15, while that in the last series is not very remote from the numbers 15, 30, 60, 120, 240, 480. It may therefore be stated, as a rough approximation to the truth, that from the fifth to the fifty-fifth year the rate of mortality increases by about 2 in the 1000 every ten years; and after the fifty-fifth year the rate of mortality doubles every ten years. This statement is a fair approximation to the truth in the case of females.

42. It is important to understand that the same age does not always represent the same degree of growth, or perfection of function. This fact is well illustrated in the female by the variable time of occurrence of the changes indicated by the appearance or suppression of the menstrual discharge. The most usual age for its first appearance is the fifteenth year; but that event may happen at any age from eight to twenty-five. In very rare instances it has occurred earlier than the eighth year, and even in the very first year of life. So also with the period of suppression. It may happen at any age from thirty-five, or even earlier, to fifty-six, or later; and it may recur at very advanced periods of life.

43. Another important consideration in regard to age relates to the fatality of the same diseases at different times of life. As age advances, the structure of the vital organs becomes impaired, and less easy of repair. The diseases of childhood, therefore, are more simple, and

more amenable to treatment than those of more advanced periods of life.

44. This general principle is well illustrated by the special case of the mortality from fever at different ages. As in the majority of fatal cases, fever destroys life by setting up inflammation in some important organ of the body, as the lungs, the bowels, or the brain, the mortality may be expected to keep pace with, and to be a measure of, the liability of the vital organs to fall into a state of disease, and to increase as the restorative power diminishes. The calculations of Mr. Finlaison, founded on the experience of the London Fever Hospital, fully confirm this expectation. If we suppose 100,000 patients to be attacked with fever, at each of the ages specified in the table, the mortality will be that shown in the column of deaths :—

Age.	Deaths.
5 to 16	8,266
15 „ 26	11,494
25 „ 36	17,071
35 „ 46	21,960
45 „ 56	30,493
55 „ 66	40,708
66 and upwards	44,643

The risk to life from fever is therefore more than twice as great at 30 as at 10 ; nearly twice as great at 40 as at 20, and at 60 as at 40 ; it is nearly five times as great at 60 as at 10, and nearly four times as great above 65 as at 20. Like results have been obtained for the febrile exanthemata, which, like fever, first affect the whole body, but in their progress attack individual organs ; for dysentery, as it attacks our troops in unhealthy stations, or under unwholesome circumstances, abroad ; and for other fatal maladies.

45. The liability to sickness, and its duration when it occurs, also increase with age. This is shown in the following tabular abstract, by Mr. Neison, of a large number of returns from English and Scotch Benefit Societies :

Age.	Percentage Sick during each Year.	Sickness per Annum among those Sick, in Weeks.	Mortality per Cent. among the Sick.
11—15	21·9	4·1	1·0
21—25	22·0	3·8	3·1
31—35	21·0	4·4	3·8
41—45	23·0	5·9	4·5
51—55	27·6	8·5	6·2
61—65	35·6	15·2	8·6
71—75	58·4	32·3	12·1
81—85	74·5	37·8	18·4

46. The differences due to temperament, diathesis, hereditary predisposition, sex, and age, are still further extended and exaggerated by *Air* and *Climate*, *Place of Abode*, *Supplies of Food and Water*, *Occupation*, *Habits*, and *Mode of Life*.

47. The most powerful of these influences is the atmosphere, which both affects the entire surface of the body by variations in its temperature, pressure, moisture, and electric condition, and by its contact with the skin, and internal surface of the lungs, produces the most important chemical changes in the blood, and, through it, in the system at large. Several subtle poisons, of which some are given off from inorganic matter, others generated by animal and vegetable decomposition, and others again by diseased living bodies, are also held suspended in the air, and, when concentrated, cause fatal accidents, or severe diseases; but when diffused in smaller quantity, impair the health, and lower the tone of the system. Smoke, dust, and metallic particles, resulting from chemical or mechanical operations, also impair the functions of the skin and lungs, and lay the foundations of fatal maladies.

48. The temperature, moisture, pressure, and electric condition of the air, modified and blended by situation, soil, and the physical conformation of the surrounding country, constitute *climate*, of which the prolonged effect on the frame is seen in the form and features, as well as in the condition of the several functions of the body. Some of these states of atmosphere deserve a separate notice, as having a marked influence upon health.

49. The *temperature* of the air is by far the most important; for it has been well ascertained that in temperate climates sickness increases as the temperature rises, while the mortality is greatest when the thermometer falls to the lowest point; so that a hot summer is very sickly, and a cold winter very fatal to life. The less mortal sicknesses of summer are diarrhœa, cholera, dysentery, and febrile affections, among the young and middle-aged; the more mortal maladies of winter are pneumonia and bronchitis among infants and aged persons. As a high temperature promotes putrefaction and decay, it is obviously favourable to diseases dependent on atmospheric impurity. Hence, in former times, when our towns were in a much worse state than they are now, sickness and mortality were both at their height in summer; and one result of the improved sanitary state of our crowded population is to shift the maximum mortality from the summer to the winter months.

50. The facts that have been ascertained respecting the influence of temperature on the occurrence of fatal maladies may be briefly stated thus:—If we divide the year, as is usual, into four equal quarters of three months each, we obtain, for England, the following results:—

1. January, February, March . .	25	deaths	per 1000.
2. April, May, June	22	„	„
3. July, August, September . . .	20	„	„
4. October, November, December .	21	„	„

51. If the twelve months are so grouped as to correspond more losely with the four seasons of the year, the mortality, for London, is epresented approximately by the following figures:—

Winter (December, January, February) . .	16 deaths.
Autumn (September, October, November) . .	15 ,,
Summer (June, July, August)	14 ,,
Spring (March, April, May)	14 ,,

52. If a still better distribution is made, into the four hottest, four oldest, and four temperate months, we have, for London, the following roportions:—

Four coldest months (Dec., Jan., Feb., March)	21 deaths.
Four hottest months (June, July, Aug., Sept.)	19 ,,
Four temperate months (April, May, Oct., Nov.)	18 ,,

o that, in whatever way the months are grouped, the coldest are most atal; while, as appears from the last comparison, the hot months rank ext in fatality, those of intermediate temperature being the least fatal.

53. The fatal effect of a low temperature is strikingly shown by a omparison made by the Registrar-General between the deaths in ten onsecutive cold days in November and December, 1856, and ten varmer days preceding and following them. The ten cold days had a nean daily temperature of 34°, and a mean nightly temperature of 27°; nd the ten warm days a mean daily temperature of 51°, and a mean ightly temperature of 47°. In the ten colder days there died of conumption 232, of bronchitis, pneumonia, and other diseases of the lungs 502, of diseases of the heart 73, of diseases of the brain 170, and of ther diseases 867. In the ten warmer days, the deaths by the same liseases, in the same order, were 163, 394, 51, 172, and 725. In conumption, bronchitis, and other diseases of the lungs, and in heart-disease, herefore, a fall of about 20 degrees of temperature caused the deaths to ise in the ratios of from 16 to 23, 39 to 50, and 51 to 73; while the otal deaths in the colder are to the total deaths in the warmer days as 8 to 15.

54. The influence of temperature in promoting disease and underminng health is most distinctly displayed in the inhabitants of temperate limates when living in countries strongly contrasted with their own.

55. The temperatures of different parts of the world are also believed o contribute largely to the diseases of the native populations. The ountries within the tropics, or bordering on them, are scourged by inermittent and remittent fevers of the most intractable types, by yellow ever, by diarrhœa, dysentery, and cholera, and by diseases of the liver; vhile the countries verging on the North Pole are the homes of catarhal affections, influenza, diseases of the organs of respiration, and scurvy; and the countries in the temperate zone, between the tropics and the poles, of fevers of the continued type, typhus and typhoid evers, with intermittent and remittent fevers of a more tractable cha-

racter, consumption, rheumatism, and cutaneous diseases of great variety, and often of great severity.

56. The diseases proper to the several regions of the globe also prevail in countries which share with them a similar temperature; so that isothermal lines, or lines of equal temperature, are lines of disease also. Thus the diseases incident to countries in or near the tropics prevail along the equator of heat, or mean annual isothermal line of 82·4° Fahr.; and in and near all that zone or region which is bounded north and south by the isothermal line of 68°; while the diseases of the temperate zone occur in the countries lying on or near the isothermal line of 50°; and those of the polar zone or region on or near the isothermal line of 41°. It may be useful to trace the course of these three isothermal lines, and to mention the countries or cities which they traverse or touch:

(1.) The isothermal line of maximum temperature, or equator of heat (82·4° Fahr.), traverses, or passes near, the southern coast of the Gulf of Mexico, the Gulf of Guinea, the Straits of Bab-el-Mandel, and the fortress of Aden, the southern point of Hindostan and the city of Madras, and the islands of Sumatra and Java.

(2.) The northern isothermal line of 68° traverses California, skirts the north coast of the Gulf of Mexico, touches the island of Madeira, the fortress of Gibraltar and the city of Algiers, runs along the south coast of the Mediterranean, and passes through China at the latitude of Nankin. The southern line traverses South America, from Potosi to Santa Fé, touches the Cape of Good Hope, and cuts off all that southern portion of Australia which has become the home of English colonists.

(3.) The northern isothermal line of 50° touches New York and the southern point of Ireland, traverses the northern coast of the Black Sea, the Caspian, and the sea of Aral, and passes between the northern and southern islands of Japan. The southern line traverses the southern point of South America, runs north of the Falkland Islands and south of Van Diemen's Land, and cuts off the southern angle of New Zealand.

(4.) The isothermal line of 41° touches Quebec, the south coast of Iceland, Stockholm, and Moscow, cuts in half the northern island of Japan, and runs south of the peninsula of Kamtschatka.

57. This sketch of the chief points of the earth's surface touched by lines of equal temperature may serve to direct attention to the influence of heat in the production of disease. It must, however, be borne in mind that the diseases incident to the several zones may pass beyond the limits assigned to them, whenever, from local causes, the temperature is raised or lowered, or when, the mean annual temperature being little changed, the summer is unusually hot or the winter unusually cold. In the one case, the diseases of the temperate zone may assume the character usually belonging to those of the tropics; in the other, they may approach more closely to those that prevail among nations nearer the pole.

58. Nor should it be forgotten that the diseases prevailing in the several zones are not wholly due to temperature. Thus scurvy, which is very prevalent and fatal in the polar zone, may be traced in part to cold, and in part to the imperfect diet which the cold itself inflicts upon the inhabitants—a diet which would occasion scurvy in any part of the world. Again, the severe and fatal diseases of the tropical zone are not solely due to a high temperature, but to heat acting upon and developing the miasma of damp and rank soils. Hence, troops and bodies of men, encamped on dry spots in the most unhealthy tropical districts, may escape, to a great extent, the prevailing maladies. It is by the discovery and occupation of such spots that the inhabitants of temperate climates can hope to maintain their possessions in countries having a much higher temperature than their own.

59. The influence of *moisture*, as distinguished from that of the emanations which it promotes, is not so easy to trace as that of temperature. There is reason, however, to believe that the inhabitants of damp soils and low-lying districts have less vigour than those of gravelly and sandy soils and the summits of hills and mountains. Experience also proves that many invalids suffer most when the air is loaded with moisture.

60. It is also a notorious fact, that excessive humidity coexists with a high temperature in regions most fatal to human life; as on the south coast of Africa, the Sunderbunds of Bengal, and the deltas of rivers, marshes, and jungles, in and near the tropics. In more temperate regions the same combination of moisture with heat proves fatal to life during summer.

61. *Atmospheric pressure* has also its effect upon health, and many invalids are susceptible even of slight changes in this respect. The oppression experienced in the diving-bell, the diarrhœa incident to those who remove to residences in very lofty situations, and the hurried respiration, quickened circulation, and tendency to hæmorrhage that accompany the ascent of high mountains, are illustrations of its more extreme effects.

62. The influence on health of the *electric condition* of the air is shown by the uneasy sensations experienced by many persons before a thunderstorm.

63. It has also been shown that the quantity of *ozone* (a modification of oxygen caused by repeated electrical discharges, and characterised by a peculiar odour and increased power of oxidation) bears some relation to the prevalence of certain diseases, having been observed to be in defect during attacks of intermittent fever and of cholera, and in excess during at least one epidemic of influenza.

64. But there are other atmospheric changes which are known to us only by their effects. Asiatic cholera, for instance, has, on four occasions, overstepped its usual limits, and spread over the greater part of the habitable globe; and the entire class of infectious and contagious

maladies exhibits variations in intensity from year to year which cannot be explained by differences of atmospheric temperature, moisture, and pressure, nor even by variations in the electric state of the air, and in the proportion of ozone. We are forced, therefore, to believe in the existence of certain obscure modifications in the state of the air, which are known as '*Epidemic Constitutions.*'

65. Although we cannot describe or explain these atmospheric conditions, we can form some idea of the extent of their influence by noting the annual fluctuations in the number of deaths due to infectious and contagious diseases. Thus, in the fifteen years from 1840 to 1854, the deaths from typhus and typhoid fever sank as low as 615, and rose as high as 1600; from erysipelas, as low as 113, and as high as 260; from whooping-cough, as low as 582, and as high as 1217; from measles, as low as 249, and as high as 1122; from scarlet fever, as low as 354 and as high as 2132; from small-pox, as low as 87, and as high as 890; and from influenza, as low as 35, and as high as 562. These are the deaths which took place in London in a million of inhabitants during the years and from the causes specified; and it will be seen that while the deaths from fever, erysipelas, and whooping-cough fluctuated nearly as the numbers 1 and 2, those from measles varied as nearly 1 and 5, from scarlet-fever as 1 and 6, from small-pox as 1 and 10; while the deaths from influenza were 16 times as numerous one year as another. Of these diseases small-pox is the only one directly influenced by legislation. The rest of the figures may be taken to prove the surpassing force of that condition of the air admitting neither of description nor measurement, and known to us only by its effects, for which we have at present no better name than 'Epidemic Constitution.'

66. These variations appear the more remarkable when they are contrasted with the slight differences in the annual rate of mortality of many other diseases, especially those which depend primarily upon structural change. The deaths from pulmonary consumption, for instance, in the same years and among the same number of persons, fluctuated between the numbers 2645 and 3941; from inflammation of the lungs, between 1340 and 2169; from cancer, between 253 and 432; and from apoplexy, between 426 and 607.

67. A still more vivid idea is afforded of the extent of these fluctuations by the fact, that no combination of causes within or beyond human control—neither the weather, nor shipwrecks, nor the imports and exports of commodities, nor the prices of food, nor the quotations of the funds—are subject to such fluctuations from year to year.

68. It is also worthy of remark that these peculiar states of atmosphere do not affect all diseases of an infectious or contagious nature in the same degree; for the smallest number of deaths from small-pox, erysipelas, and measles, and the largest number of deaths from small-pox and influenza, occurred in years in which no other of the diseases

ust mentioned attained their highest or lowest numbers; while the least number of deaths from influenza coincided with the greatest number from measles; and the least number from typhus fever with the greatest number from whooping-cough. On the other hand, the least mortality from scarlet fever and typhus coincided in the year 1841, and the greatest from scarlet fever, typhus fever, and erysipelas, in 1848. But the epidemic visitations of cholera occurred in years marked by no peculiar excess or defect of any of these diseases.*

69. *Contamination of the air* is a most efficient cause of impaired health, as well as a prolific source of disease. In rural districts exhalations from stagnant pools and marshes, and from collections of manure, destroy the purity of the air; while the atmosphere of large towns is subject to additional sources of pollution in the decomposition of animal and vegetable substances, the refuse of manufactories, the smoke resulting from the imperfect combustion of fuel, and the dust created by constant traffic.

70. These impurities in the air of large towns, existing both within and without the dwellings of their inhabitants, tend to modify the health of those reputed healthy, and to render them liable to diseases distinguished from those of rural districts by an absence of power or tone; so that a disease which in the country would bear and might require bloodletting, would, in large towns, scarcely admit of depletion, and might even demand an opposite mode of treatment. This depressing effect of the atmosphere of large towns, displayed in the pallid aspect of those who are esteemed healthy, and in the want of power accompanying their diseases, is a fact of great practical importance, always to be borne in mind at the bedside.

71. A residence in large towns makes itself most felt in those of its inhabitants who work within doors, and who, in addition to the impure air of the town itself, inhale the close and heated atmosphere of shops and workshops, often in the absence of the wholesome stimulus of light. These persons exhibit, in an exaggerated form, the peculiar influence of a town life, and their diseases are marked in a still greater degree by want of power. So that there is as much difference between the indoor and outdoor labourers of large towns as between the inhabitants of town and country. A less marked difference is also to be observed between those who work within doors, with little and with more exertion.

72. Town life, then, reduces the strength and vigour of the frame, and predisposes to diseases characterised by want of tone and power; and this effect is more marked in persons employed within doors and in those whose occupations demand least exertion.

73. Many of the inhabitants of large towns who follow indoor employments, are exposed to another depressing and exhausting in-

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* See Dr. Guy's two papers in "Statistical Journal," years 1855 and 1857.

fluence, namely, long hours of work or service, often extending far into the night, and sometimes usurping almost all the time that should be devoted to sleep. The London bakers during the whole of the year, compositors (and, it is to be feared, many of the most successful men in all trades and professions) during the session of Parliament, and milliners and dressmakers in the fashionable season, suffer greatly from this cause.

74. The injurious influence of the causes just specified may be inferred from the excessive mortality of the inhabitants of large towns. Thus, while the annual mortality of rural districts in England and Wales varies from 18 to 22 in the thousand, that of town districts, not being seats of manufacture, will often amount to 25; and that of populous manufacturing towns and crowded sea-ports to 35, or even more. The mortality in some continental capitals exceeds 40 in the thousand, and the very highest of these rates is exceeded in the worst districts of almost all our large towns.

75. These figures present, it is true, an exaggerated view of the case, inasmuch as they are founded only on the number of deaths compared with the number of the living. When the ages of the living are taken into account, these differences are brought within much narrower limits.

76. It must not, however, be supposed that the rural districts enjoy an immunity from the causes which impair the vigour and shorten the lives of the inhabitants of towns. Defective drainage and obstacles to the free movement of the external air often combine with overcrowding and neglect of cleanliness within doors, and a scanty and unwholesome diet, to counteract the beneficial influence of wholesome labour in the open air, and so impair the strength as to predispose to diseases of the low type prevalent in crowded city populations. Overwork, also, is not an evil limited to town populations.

77. Many country places also share, with the least healthy portions of our large towns, the evil of a rich and ill-drained soil. Many a small village or isolated house in the country, like the old town of Liverpool, stands on a swamp, catching the water from higher ground; and inviting a visit from every pestilence that happens to prevail.

78. The diseases which cause the high mortality of town populations are, in accordance with what has been just stated, the scrofulous affections of children, and the pulmonary consumption of the adult, together with febrile diseases and exanthemata characterised by an unusual tendency to the typhoid or adynamic form. The dust and smoke suspended in the air also give rise to diseases of the lungs, which exist in their most severe and fatal form among the scythe, knife, and needle grinders of Sheffield.

79. Next to impure air and unwholesome residences, as causes of debility, comes scanty or unwholesome food. Insufficient nourishment is a chief cause of that want of power and tone which has been pointed

out as marking the inhabitants of large towns, and of some of our least favoured rural districts. In infancy and childhood, again, a diet not merely unequal to the wants of the frame, but unsuitable to the age, or destitute of some essential element of growth, often sows the seeds of future weakness and disease. At all ages, too, the poor either consume unwholesome food, or live on a diet wanting in the requisite variety of elements. Hence land scurvy and other allied diseases. Hence also, in earlier periods of our history, that scorbutic state of the mass of the population, which, co-operating with fevers, plague, and small-pox, gave rise to a destruction of human life of which happily we have now no experience.

80. Water supplied in quantities insufficient for cleanliness, or of a quality unfit for drinking, is also among the recognised causes of impaired health and actual disease. Water may also become the vehicle for the poison of lead, and, as recent experience has shown, of animal poisons thrown off from the body itself. Hence the part it bears in the propagation of fever and cholera.

81. Another cause of weakness and disease is the abuse of spirituous liquors, to which the inhabitants of large towns are peculiarly addicted. Its effect on health is seen in the pallid and sodden aspect of the drunkard; its influence on the character and course of disease in the fatal effects so often attending the slightest injuries in brewers' draymen and other intemperate persons; and its agency in shortening life by such facts as the following:—

82. In men peculiarly exposed to the temptation of drinking, the mortality before thirty-five years of age is twice as great as in men following similar occupations, but less liable to fall into this fatal habit; and the rate of mortality among persons addicted to intemperance is more than three times as great as in the population at large. At the earlier periods of life the disproportion is still greater, being five times as great between 20 and 30, and four times as great between 30 and 50. The annual destruction of life among persons of decidedly intemperate habits has been estimated at upwards of 3000 males and nearly 700 females, in a population of nearly 54,000 males and upwards of 11,000 females addicted to intemperance. Most of these deaths are due to delirium tremens and disease of the brain, or to dropsical affections supervening on disease of the liver and kidneys.

83. This extensive prevalence of intemperance among the English population should be borne in mind, especially as no fact is better established than the great danger of treating the diseases of intemperate persons by depletion or lowering remedies. The same remarks apply in a less degree to tobacco, chewed or smoked. The frequent union of drinking and smoking, and the fact, that, up to this time, no special structural disease has been traced to the excessive use of tobacco, obliges us to speak with some hesitation on this subject. But the fact that such good authorities as the late Sir Benjamin Brodie have strongly

denounced this otherwise most objectionable habit, affords good reason for condemning it.

84. Luxury, too, like intemperance, tends to undermine health and shorten life. Hence the higher orders are short-lived, and we may therefore safely infer, unhealthy while they live. Our agricultural labourers, in spite of their many disadvantages, live much longer; and the aristocracy are nearly on a par with the members of benefit societies in Liverpool, the unhealthiest city in England. Of the classes, too, which enjoy the most ample means of self-indulgence, those are most healthy who are least tempted. Thus the gentry are longer-lived than the aristocracy; the aristocracy, than the members of royal houses; and these last than crowned heads. Those who occupy the highest place in the social scale are probably, in point of health and longevity, but little raised above the very meanest of their subjects. In wealthy communities, persons who have no occupation of sufficient importance to interest and occupy the mind always abound. They constitute a large proportion of the class of habitual invalids, and those among them who have retired from a life of active exertion are believed to be the greatest sufferers.

85. But while the unfortunate possession of wealth unpurchased by exertion tempts young men to sloth, luxury, and dissipation, and older men to less active self-indulgence, other classes are exposed to similar evils. The soldier, in time of peace, suffers from the *ennui* of insufficient employment, is strongly tempted to indulge in dissipation, and is exposed, at the same time, to the evils of overcrowded and unwholesome barracks. Confinement, and the absence of employment calculated to interest and excite the mind, also undermine the health of prisoners and paupers. Recent inquiries have proved that the life of the soldier in time of peace is shortened by the causes now specified, and that the perfect sanitary arrangements of our prisons barely suffice to place their inmates on a level with the community at large; and it is highly probable that for every life which poor-laws save by averting starvation, a hundred are sacrificed by the imprisonment they inflict, and the contagious maladies which they promote. It is also probable that the self-imposed sloth of the wilfully destitute is as fatal as the involuntary privations of honest poverty.

86. The enumeration of the causes of the wide differences existing between individuals reputed healthy, would be incomplete if no notice were taken of that strange and inexplicable change wrought in the body by contagious or infectious maladies, and especially by the febrile exanthemata, which confers a complete immunity from, or greatly diminished liability to, a second attack of those diseases. A similar result is brought about in one instance by a disease nearly allied to, but not identical with, the disorder from which the body is protected—by vaccination as a preventive of small-pox.

87. Nor should we pass unnoticed a fact most important in its bearing, both on the treatment of disease, and the expectations we form of its

success, namely, the existence of *latent disease* of the more important organs of the body. The lungs, heart, liver, or kidneys, which have seemed to perform their functions well, so long as they were not exposed to any unusual strain, may prove quite unequal to the strange work imposed upon them by the congestion which attends the cold stage of febrile and inflammatory disorders, by the quickened circulation of the hot stage, or by the quick development of poisonous matters in such diseases as typhus and typhoid fever, scarlatina, or cholera. Let the function of the lungs be greatly hindered, or that of the kidneys wholly suspended, and the blood becomes charged with a poison which the frame, already diseased, is powerless to eliminate.

88. The foregoing considerations respecting health, and the differences that exist between one individual and another, may be thus summed up :—There are many original and many acquired differences between man and man. The original differences are those conveyed by the terms Temperament, Diathesis, Hereditary Predisposition, and Idiosyncracy; to which we may add those dependent on Sex and Age. The acquired differences are due to Air and Climate, Place of Abode, supplies of Food and Water, Habits, Occupation, and Mode of Life ; and, in certain instances, to diseases previously undergone, and latent maladies unconsciously existing.

89. When, therefore, we take into consideration the original differences between man and man, and the various and complicated influences to which the body is exposed in all states of society, but especially in highly-civilized communities, no additional argument will be necessary to establish the first great principle on which much of the practice of medicine hinges—*that in health, and (by natural inference) in disease, every function of the body varies in different persons within wide limits of intensity.* This fact is the key to the imperfection of Medicine as a Science and its difficulty as an Art.

90. DISEASE.—To define disease we must first have defined health, for the one is but the negation of the other. In like manner, the description and right understanding of disease depend upon the description and right understanding of health. Without attempting a formal definition, it will suffice to state, that disease is present when any structure of the body is changed (provided that change be not the direct and immediate effect of external injury), or when any function is either unnaturally active, or torpid, or altered in character.

91. There is one important practical distinction which may be properly insisted upon in this place: a distinction between disease, structural or functional, and those unhealthy *states of system* brought about by the prolonged operation of the causes enumerated in § 69–87. Previous to becoming the subject of any well-defined disease, the constitution may have been brought, by the continued action of one or more of these causes, into a state which shall cause the disease itself to assume a more or less severe form, and even to depart in some respects from its usual character and course. Success in practice depends in no small

degree on the prompt recognition of these *States of System*, as well as of the several individual peculiarities pointed out in § 4–45.

92. Diseases vary much (*a*) in their nature; (*b*) in their form or type; (*c*) in their duration and course; (*d*) in their terminations; and (*e*) in their mode of occurrence. Under these heads certain terms in common use will be explained.

(*a*) *Structural.*—Consisting in alteration of structure.

Functional.—Consisting in disordered function.

Common.—Presenting the usual characters of common inflammation, &c.

Specific.—Peculiar, or departing from the common character.

Malignant.—Structural diseases for which no remedy has yet been discovered, and which spread from texture to texture: as cancer. Also diseases which assume a very dangerous and intractable character: as malignant cholera, malignant typhus, malignant scarlet fever.

Idiopathic.—Not dependent upon any other disease,

Symptomatic.—Dependent upon, or being a symptom of, some other disease; as dropsy following disease of the heart, liver, or kidneys.

Primary.—The first in a succession of diseased conditions: for instance, a primary venereal sore.

Secondary.—Following after or upon some other disease: as secondary syphilis.

93. (*b*) *Continued*—Running their course without interruption in their symptoms.

Intermittent or Periodical.—Interrupted by intervals of health.

Remittent.—Having an alternate augmentation and diminution, but no complete cessation of symptoms.

94. (*c*) *Acute.*—Of short duration and great severity.

Chronic.—Of long duration and slight severity.

These may be combined, as in ague, which is *chronic* in duration and *acute* in severity, or they may run into each other, the acute subsiding into the chronic, and the chronic being heightened into the acute. In one instance, the terms *acute* and *chronic* have been incorrectly used as mere marks of severity; thus articular rheumatism is called *acute* rheumatism, or rheumatic fever, and rheumatism of the muscles *chronic* rheumatism.

Sthenic.—Marked by vigour and excitement: nearly synonymous with acute.

Asthenic.—Characterised by want of vigour, and nearly synonymous with *typhoid* and *adynamic*.

95. (*d*) Most diseases terminate in complete recovery; a considerable number in partial or incomplete recovery; and one attack of illness in each person ends fatally.

Recovery, even when complete, is generally gradual, but in certain cases the transition from disease to health is rapid and even sudden. The interval between the subsidence of the disease and the restoration of health is termed *convalescence*. If, during this period, the disease returns, the patient is said to suffer a relapse; and this is so common an occurrence in one form of continued fever that it has been called *relapsing fever*.

The diseases from which the recovery is slow, are mostly those that exhaust the patient's strength by their severity or long duration; such as fevers, acute inflammations, exhausting discharges, and paralytic affections. The diseases from which recovery is sudden or rapid are for the most part dependent on mechanical causes, such as calculi in the gall-duct or ureter. Neuralgic attacks also frequently pass off suddenly, to return with as little warning.

Sometimes diseases terminate suddenly by profuse discharges, eruptions, or external inflammations. Such events are termed *critical*, or they are called *crises*. Observation, both ancient and modern, seems also to have proved the existence of *critical days*, that is to say, days on which febrile disorders are prone to take a favourable turn.

Diseases may also be said to terminate by *metastasis*, or transference from the part first attacked to some other, as from the joints to the stomach, heart, or brain, in gout; or by extension to a texture similar to the one originally attacked, as when acute rheumatism having commenced in the fibrous textures surrounding the large joints, seizes upon those in and about the heart.

96. (*e*) *Contagious and Infectious.*—Both these terms are now used to designate diseases communicated from one person to another; the first by contact, the second without contact.

Epidemic.—Attacking a number of persons at the same time, and recurring at irregular intervals; as fever and small-pox. Some of these diseases, as cholera and influenza, spread from place to place with great rapidity, and attack at or about the same time the inhabitants of whole continents.

Endemic.—Peculiar to certain localities, as ague, goitre, elephantiasis, &c. The same disease may be both epidemic and endemic: thus, typhus fever, which is endemic in certain districts of large towns, becomes epidemic in those districts in certain seasons or years; cholera again is endemic in India and epidemic in Europe.

Sporadic.—This term is applied to epidemic and endemic diseases when they attack one or two persons only, in which case they are said to occur *sporadically*. Such attacks are common at the beginning and end of epidemics.

Zymotic.—This term, derived from a Greek word signifying ferment, is now applied to the entire class of epidemic, endemic, and contagious diseases. It is convenient as grouping together diseases allied to each other by similarity of cause, but objectionable as based upon a mere hypothesis obviously inapplicable to cases of sudden death due to the operation of atmospheric and other poisons.

97. *Names of Diseases.* (Medical nomenclature.)—No uniform plan has hitherto been pursued in giving names to diseases. The greater number have been named from some prominent symptom, as fever (from *ferveo*, to burn), hydrophobia, diabetes; others from their seat and

nature combined, as hydrocephalus, water on the brain; or the seat is indicated by the root, and the nature of the disease by a common termination. Thus the words pericard*itis*, pleur*itis*, ir*itis*, mean inflammation of the pericardium, of the pleura, of the iris. Words in common use have also been superseded by terms descriptive of the nature of the disease; as *hyperœmia* (excess of blood), qualified by the words general, local, active, and passive, for plethora, inflammation, and congestion; and *anœmia*, similarly qualified, for chlorosis.

98. *Classification of Diseases.* (Nosology.) — All the systems hitherto proposed have rested on some theory now disallowed; and they have been attended with the usual inconvenience of all premature generalization—the inconvenience of associating dissimilar things, and separating such as are closely and naturally allied. For men engaged in learning, teaching, or practising medicine, that arrangement is best which classifies diseases according to their nature, when that is sufficiently ascertained, and in other cases according to the part of the body which they attack. But for state purposes that nosological system is to be preferred which places most prominently before the public, as a distinct class, the diseases admitting of prevention or mitigation by sound sanitary measures. In this point of view, the classification adopted by the Registrar-General is deserving of commendation. A very complete classified list of diseases has also been recently put forth by the College of Physicians. The list comprises diseases, general and local; poisons and injuries; with an appendix of surgical operations, human parasites, and congenital malformations.

99. There are some general considerations connected with disease of far higher importance than the use of terms, or the adoption of a correct nomenclature and scientific classification. These will be treated under the following heads:—(*a*) Causes; (*b*) Symptoms and Signs; (*c*) Diagnosis; (*d*) Prognosis; and (*e*) Treatment.

100. (*a*) *Causes of Disease.* (Etiology.)—The causes of disease may be conveniently divided into *proximate* and *remote.*

Proximate Causes (Causæ abditæ, continentes, occult causes.)—This term has arisen out of the twofold meaning of the word disease. When it is named from the part it attacks, and the nature of the change that part is undergoing, as pericarditis, or inflammation of the pericardium, the proximate cause is the disease itself; but if the name is the representative of a group of symptoms, as cough, dyspnœa, hectic fever, emaciation, &c.—the symptoms of pulmonary consumption—then the term proximate cause means the suppurating tubercle which gives rise to all these symptoms. If we are ignorant of the seat of a disease, as is the case with fever, the search after a proximate cause is but an inquiry into its real nature.

Remote Causes. (Causæ evidentes.)—All constant antecedents of an event are called *causes* of that event, and all constant consequences are called *effects.* Hence the same thing may have many causes. Thus an hereditary taint, intemperance, or want, and a common cold, may unite in the same person as causes of pulmonary consumption. The hereditary taint may have rendered the person liable to the formation of tubercle, intemperance or want may have occasioned its actual deposition, and the cold may have excited it into activity. All these are *causes* of consumption, and the consumption may become the cause of death. How then are such causes to be distinguished from each other? They are divided into *predisposing* and *exciting*. In this instance, the *predisposing* causes are the hereditary taint, and the mode of life: the *exciting* cause is the cold: and the *proximate* cause (if the term must be used) the suppurating lung.

The condition of the body itself, however brought about, is the *predisposing cause* of any disease which may befall it: the *exciting causes* are, for the most part, external agents, such as cold and heat: these are also among the most powerful *predisposing* causes. Thus that combination which we call climate is the predisposing cause of a great variety of diseases; and any one of the elements of which it consists may become an exciting cause.

Some of the principal predisposing causes of disease have been already considered (§ 4—87) when speaking of temperaments, diatheses, hereditary predispositions, and idiosyncracies: of sex, age, occupation, and mode of life: of residence and climate. The local or constitutional injuries which supervene on severe attacks of illness must also be regarded as causes predisposing to fresh attacks of the same disease.

The exciting causes of disease are chiefly mechanical and chemical injuries, unwholesome food, undue exertion of mind or body, sudden and violent atmospheric changes, parasitic animals and plants, atmospheric poisons, poisons generated by the human body itself, and those of venomous insects, reptiles, and mammalia.

101. (*b*) *Symptoms and Signs of Disease.* (Symptomatology, semeiotics.)—All lesions of structure, whether from external injury or from internal change, cause some disorder in the functions of the body, and almost every disorder of one function leads to derangement in those most closely connected with it. These disordered functions are called *symptoms*. Thus redness, swelling, heat, and pain are symptoms of inflammation; and fever, which is itself recognised by a certain combination of symptoms, is a symptom of inflammation.

102. The term symptom is variously qualified in medical writings. There are *anamnestic* symptoms, or those which relate to a patient's previous state of health; *diagnostic*, or those which distinguish his disease from others; *prognostic*, or such as enable us to predict the event of his disease; *pathognomonic*, or those peculiar to his malady, and to that alone; *therapeutic*, or such as indicate the proper treatment; *objective*, or such as can be seen, or otherwise perceived, by the physician himself; *subjective*, or such as consist in sensations of the patient.

103. But we have also *signs* of disease; and the word *sign* has not the same meaning as the word symptom, though the two are some-

times used without much discrimination. The difference is best shown by an example. Cough, expectoration, dyspnœa, hectic fever, night-sweats, and emaciation are *symptoms* of pulmonary consumption, but they are not *signs*, for they may all occur in other diseases; but cavernous respiration and pectoriloquy are signs. So also expectoration is not a *sign* of consumption but a symptom, for it occurs in other diseases of the lungs; but a certain kind of sputa is stated to be a *sign* of that disease. *Signs*, therefore, are pathognomonic or diagnostic symptoms; and there is nearly the same difference between a symptom and a sign as between a character and a characteristic. Redness, pain, heat, and swelling are symptoms, characters, or phenomena of inflammation; but redness and heat are at the same time symptoms and signs, characters and characteristics: pain and swelling are merely symptoms.

104. The term *physical* sign is in common use among medical men; it means a sign which is an object of sense. Thus, heat, redness, and swelling are physical signs of inflammation; pectoriloquy of phthisis; coagulable urine of disease of the kidney. A physical sign is, therefore, synonymous with an *objective* symptom.

105. Symptoms are converted into signs by careful examination. If, for instance, a patient complain of pain in the chest, we proceed to ascertain whether it is external or internal, and if internal, what is its precise seat. If, again, a patient void urine different from that of health, we submit it to chemical tests, or examine it by the microscope, that we may find out the exact nature of the change it has undergone, and trace that change to its source. In this way we learn what the disease is, what its severity, what the proper treatment, what the hope of recovery. The more important methods of examination, and especially those which require the use of instruments or tests, are described in chapter iv.

106. The symptoms of disease are of very variable intensity; and even the most characteristic are sometimes wanting, or replaced by their opposites. Thus, a frequent pulse is a most constant symptom of pulmonary consumption; but in some cases it does not exceed its average in health; while in others it falls below it; and of two attacks of consumption occurring in the same person one has been known to be marked by a frequent, the other by an infrequent, pulse. This same symptom of increased frequency of pulse is among the most constant and characteristic attendants on fever, and yet some epidemics have been distinguished by a pulse below the standard of health.

107. (*c*) *Diagnosis*, or the discrimination of diseases, is the necessary prelude to their treatment. It presupposes a correct observation and just appreciation of symptoms, and may be said to be the art of converting *symptoms* into *signs*.

108. The first impression a patient makes on his physician is always an important element in the diagnosis. In most cases it enables him to form some idea of his previous habits of life; to determine whether

e is suffering from a slight or a severe illness; and, in many instances, o decide at once upon the nature of his complaint. Thus, anæmia, onsumption, pneumonia, emphysema, Bright's disease, fever, and evere disease of the heart, are often strongly marked on the very ountenance of the patient; and many other diseases, such as palsy nd chorea, gout and rheumatic fever, tetanus and hydrophobia, several f the exanthemata, and skin diseases in general, betray themselves by ingle strongly-marked symptoms. The diagnosis in such cases is very asy; but the task of the physician is much more difficult when the isease is either imperfectly developed, as in the first stage of eruptive evers, and in incipient phthisis, or when the only obvious symptom is ne which, like dropsy, may depend on several causes; and it is still ore difficult when the nature of the complaint must be inferred chiefly rom the patient's description of his own sensations, or from a mere pereption of the size and shape of a part of which the structure is concealed rom view, as happens with the greater number of tumours, both xternal and internal. These are the cases which put the knowledge nd skill of the physician to the test, and sometimes baffle both.

109. In some cases we have to wait till the characteristic symptoms how themselves; in others, to make minute stethoscopic examinations; n others, to test the urine, or to use the microscope; and in a few, to onfess our ignorance. The effects of remedies, such as bloodletting nd stimulants, also, in rare instances, serve as means of diagnosis. The ymptoms which render us most assistance in distinguishing one disease rom another will be carefully examined in a future chapter.

110. (*d*) *Prognosis.* This word means foreknowledge, and, as used y the physician, the anticipation of the course and event of diseases. he power of foretelling the progress and termination of a malady is of he first importance, both as regards the treatment to be adopted, the ell-being of the patient, his own satisfaction and that of his friends, nd the reputation of the physician himself. A correct prognosis imlies a just diagnosis, an accurate knowledge of the natural course and rogress of disease, an appreciation of all the peculiarities, original and cquired, which distinguish one man from another (§ 4—87), and expeience of the virtues and power of remedies.

111. Among the questions which the physician may be called upon o solve one of the most common is, whether the disease admits of cure? he answer is sometimes very easy. A case of hydrophobia or of ysteria would present no difficulty. The one is as certainly fatal as he other is curable. But in a case of tetanus, of pneumonia, or of ulmonary consumption, the prognosis is more difficult. The first ould be most probably fatal; the second is always attended with anger, the amount of which will chiefly depend on the sex, age, temerament, and previous habits of the patient; the third is fatal in a arge majority of cases, and the probability of ultimate and complete ecovery is very slight.

112. This latter disease—pulmonary consumption—affords a good

example of the necessity of caution in forming and stating our prognosis. The disease is incurable, and medicine, at best, only palliative; but if, in every case, a physician were to foretell a fatal result, his reputation would suffer severely, for the simple reason that consumption, though ultimately fatal in nine hundred and ninety-nine cases out of a thousand, is not necessarily fatal in any given attack, recoveries from several successive attacks being by no means unusual; and this happens, not because the disease is curable, but because its fatality depends on the amount of tubercular deposit, and the issue of any particular attack on the extent and activity of the suppurating process relatively to the power of the patient to bear the wear and tear consequent upon it. This is the true explanation of the asserted efficacy of medicines, regulated temperature, and change of climate in this disease, and of the reputed success of those irregular practitioners who select it as the object of their attention partly for the reasons assigned, and partly on account of the great number of people subject to its attacks.

113. This is the place to speak of that *vis medicatrix naturæ*—that power inherent in the human frame to right itself when suffering under severe disorders—which our predecessors were wont to acknowledge with such befitting modesty as their invaluable coadjutor in the treatment of disease. We who withhold from nature the tribute that is her due, are as unwise as we are unjust; for it is the obvious interest of the regular practitioner to extol the powers of nature, and to attribute to them a large share of the success so commonly ascribed to his own treatment. It is only in this way that the public can be rescued from the grasp of empiricism. The homœopathist (slave of an hypothesis invented by a heated enthusiast, and mainly supported by imaginary sensations developed by experiments on his own person) attributes to infinitesimal doses virtues simply ridiculous, and results utterly impossible; but the regular practitioner can explain the cures alleged to have been thus effected by that very *vis medicatrix* which so constantly stands him in stead in his own treatment of disease, and to which he so rightly attributes so much of his own success. It is this *vis medicatrix* which, counteracted by active medicines, but restored to freedom by non-interference, constitutes the really efficient agent of a race of quacks whose treatment, if honestly carried out in accordance with their own principles, would be perfectly harmless if it did not shut out prompt and active treatment in those cases which demand it. There are other quack medicines besides those given by the homœopath, which, though far from harmless when carelessly administered, prove of real service in certain instances. The public is informed of these successful cases; not of the unsuccessful or the fatal ones. The frequent recoveries from pulmonary consumption, either without treatment, or under the use of remedies which could not have exercised any influence on the disease, goes far to complete the explanation of the success of quackery in its several forms and guises; while the alleged efficacy of change of climate in the same disease is an apt illustration of the occasional identity of the mistakes made by the regular and irregular practitioner.

114. These observations on the *vis medicatrix* receive support from the history of some of the greatest improvements in the art of healing. Three centuries ago, for instance, surgeons thought that they ought to treat gun-shot wounds with boiling oil. But Ambrose Paré, through the happy accident of his supply of boiling oil falling short, was led to adopt that better treatment which consists in virtually leaving the sufferer in the hands of nature. At the same time, a contemporary of that great surgeon was boasting of his success in treating these wounds by a slimy mixture called the 'oil of whelps,' which had, in reality, the same happy effect of leaving nature to work her own cure in her own way.

115. It follows, then, that to determine whether a patient's recovery has happened through the treatment adopted, or independent of it, or in spite of it, is often a task of extreme difficulty. The best physician may often decide amiss; the ignorant empiric and equally ignorant public are utterly unqualified to form an opinion.

116. (*e*) *Treatment.*—A correct diagnosis, a knowledge of the nature of the disease itself, of the constitution of the sufferer, and of the virtues of remedies, are essential preliminaries to judicious treatment. The object to be aimed at will vary with each case. In one, it will suffice to remove the ascertained cause; in another, it will be necessary to restore the healthy function or repair the diseased structure; in a third, to palliate the suffering which the disease occasions.

117. Our treatment is sometimes founded on a correct knowledge of the nature of the disease and the mode of operation of our remedies, in which case it is said to be *rational*; in other instances, we act in ignorance of both, and then it is said to be *empirical*. Again, it may be *curative*, or such as to restore the patient to perfect health; *palliative*, or adapted to the alleviation of suffering; *preventive*, or calculated to obviate the recurrence of disease, by maintaining habitually a better state of health.

118. The abstraction of blood in inflammation is an example of *rational* treatment, for we know both the condition of the part affected and the *modus operandi* of the remedy. The use of quinine or arsenic in ague is merely *empirical*, for we understand neither the nature of ague nor the mode in which these medicines affect the body in curing it. The treatment of pulmonary consumption is necessarily *palliative*, for, from the very nature of the complaint, it is obvious that it does not admit of cure. Such also is the case with many neuralgic affections, and with all malignant diseases.

119. In the treatment of many diseases we combine the rational with the empirical, the curative with the palliative. Thus, during an attack of remittent fever, we might abstract blood to subdue local inflammation, use cold-sponging to diminish the heat of the surface, stimulants to counteract debility, and quinine to effect a cure.

120. Though the employment of remedies, the *modus operandi* of which we do not understand, is *empirical*, the act of generalisation by

which we infer the utility of the same remedies in analogous disorders, lends to our empiricism something of a rational character. For example; though the employment of quinine and arsenic in ague was originally pure empiricism, the use of those remedies, in the whole class of intermittent disorders, as a consequence of analogical reasoning, is entitled to a more complimentary epithet.

121. In treating disease we are necessarily guided by the existing state of the patient. If, for instance, the skin, gums, and tongue are pale, we prescribe some preparation of iron; if, on the contrary, they are florid, we shall probably order depleting or lowering remedies. Now these opposite states are said to afford *indications* of treatment—grounds or reasons, that is to say, for giving preparations of iron in the one case, and resorting to lowering measures in the other. On the other hand, these same states of system constitute grounds for avoiding the opposite modes of treatment; in other words, they are *contraindications* of depletion and tonic treatment respectively. In like manner acute inflammatory symptoms, occurring in robust persons, *indicate* lowering remedies, and *contraindicate* stimulants.

122. The considerations brought forward in this chapter will serve to show the extreme difficulty which attends the practice of medicine, and the necessity imposed on the physician of supplying himself with very extensive and precise information on all the subjects which can conduce to a knowledge of the human body, on the one hand, or of the virtues of remedies, on the other. But, after all that can be done, the science of medicine must remain extremely imperfect, and the art of healing very difficult. Our general principles, derived originally from particulars made up of many variable elements, must be reapplied in practice to individual instances as complicated as those out of which they were originally formed, so that precision is, in the nature of things, impossible, and certainty of very rare attainment.

123. Other considerations, which go far to explain the acknowledged difficulty of medicine, both as a subject of scientific inquiry and of practical application, are:—the variable severity of diseases bearing the same name, the changes that occur in the progress both of acute and chronic cases, and the unequal strength of our remedies. When we reflect that, prior to the setting in of any given disease, the constitution of the patient, originally marked by peculiarities traceable to hereditary predisposition, has been subsequently modified by the powerful influences already examined; that the disease itself may vary within wide limits of intensity; that it passes naturally through many different phases; that it may fall under observation and treatment at any part of its course; that the remedies prescribed, being of variable strength, may be administered with more or less care and regularity, and the patient be tended with greater or less watchfulness and skill:—when we take all these circumstances into consideration, we cannot be surprised that medicine should be the most imperfect and uncertain of sciences, a conjectural and most difficult art.

CHAPTER II.

CAUSES OF DEATH.

124. THOUGH the causes of death interest chiefly those medical men who are engaged in preventing disease, the practical physician profits by the study of them, inasmuch as he learns the relative frequency of the more severe diseases, and the demands they severally make on his attention.

125. The causes of death form three leading groups; of which the first comprises mechanical injuries, scalds, burns, and corrosions, the several forms of suffocation, cold, want, intemperance, and poison; the second, debility in infancy and decay in age; and the third, disease properly so called. In England the deaths are distributed through these three classes in the following proportions:—

Class I., 4 deaths; Class II., 16 deaths; Class III., 80 deaths.

126. In Class I. about half the deaths are caused by mechanical injuries; about a fourth by the several forms of suffocation (hanging, drowning, &c.); less than a fifth by burns and scalds; one per cent. by cold and want; three per cent. by poison; and three per cent by intemperance (exclusive of delirium tremens and other fatal diseases occasioned by excess).

127. In Class II. the deaths are divided between those that occur in early infancy from incomplete development and inadequate nutrition, and deaths from old age; the excess being somewhat on the side of the first division.

128. The 80 deaths in the 100 that remain after subtracting Classes I. and II., may be distributed into a few leading groups of disease. A very large and important group consists of epidemic diseases propagated by contagion or infection, which destroy life by giving rise to severe local affections or by exhausting the vital powers. This comprises small-pox, scarlet fever, measles, whooping-cough, typhus and puerperal fevers, and erysipelas. A second class of epidemic maladies is due, like the foregoing, to external causes, but not to contagion, or, if to contagion, not exclusively. To this belong ague, remittent and typhoid fevers, influenza, diarrhœa, dysentery and cholera, diphtheria, quinsey, and carbuncle. A third class consists of diseases that prove fatal chiefly to infants and young children. They have their source in the local irritation of teething, worms, or constipation, and lead to fatal affections of the brain and of the intestinal canal. This comprises infantile fever, marasmus, and hydrocephalus. A fourth—the largest class of all—is made up of diseases which consist in a structural change or degeneracy

of some texture or organ. To this belong scrofula, pulmonary consumption, and cancer. Diseases occasioned by some special impurity, or change of consistence, in the blood, constitute another class, of which rheumatic fever, scurvy, and gout, with pyæmia, are members. The remainder of the list is made up of fatal diseases of special organs, and of the accidents attendant on childbirth. Of special organs, those of respiration (even after exclusion of pulmonary consumption) occasion the highest mortality; then, in order, those of the brain and nervous system; organs of digestion; heart and circulation.

129. The 80 deaths from disease remaining after subtracting from the whole 100 deaths those due to all other causes, are made up in the following manner:—

Diseases due to Structural Degeneration (including Pulmonary Consumption)	16
Diseases of the Organs of Respiration (exclusive of Pulmonary Consumption)	15
Contagious and Infectious Diseases	14
Diseases of Infancy and Childhood	9
Diseases of the Brain and Nervous System	7
Epidemic Diseases not being Contagious	6
Diseases of the Organs of Digestion and Assimilation	6
Diseases of the Organs of Circulation	4
Diseases due to changes in the Blood	1
Diseases of the Urinary Organs	1
Childbirth, &c.	1

130. If we distribute fatal diseases, as far as possible, in accordance with the parts which they attack, we obtain, for 1000 deaths, the following results:—

Organs of Respiration	320	
Brain and Nervous System	144	
Organs of Digestion and Assimilation	104	
Heart and Organs of Circulation	35	
Urinary Organs	10	
Childbirth and Organs of Generation in the Female	10	
Joints and Organs of Locomotion	9	
Skin and Integumentary System	6	638
All other causes		362
Total		1000

131. If from diseases of organs and systems of organs we pass to single diseases, we obtain for 1000 deaths, the following figures:—

Pulmonary Consumption	125
Bronchitis and Asthma	78
Pneumonia	62
Convulsions	59
Scarlatina	41

Typhus and Typhoid Fever	38
Diarrhœa, Dysentery, and Cholera	36
Whooping-Cough	24
Paralysis and Apoplexy, each	21
Hydrocephalus and Measles, each	18
Cancer	14
Tabes Mesenterica	11
Croup and Teething, each	10
Influenza, Inflammation of Brain, and Bowels, each	8
Scrofula	7
Small-Pox	6
Erysipelas, Epilepsy, and Rheumatism, each	5
Ileus, Intussusception, and Intestinal Stricture	4
Inflammation of the Liver, Peritoneum, and Larynx, Jaundice, Ileus, Pleurisy, and Thrush, each	3
Syphilis, Ulcer of Intestines, Hernia, Ascites, Inflammation of Stomach, and Bright's disease, each	2
Pericarditis, Remittent Fever, Delirium Tremens, Insanity, Diabetes, and Infantile Fever, each	1
Quinsey, Purpura, Aneurism, Cyanosis, Gout, Intemperance, Inflammation of the Bladder, Carbuncle, Inflammation of the Kidney, Stone, Stricture of the Urethra, Ovarian Dropsy, Noma, Tetanus, Ague, Ischuria, Fistula, and Chorea, each less than	1

The mortality from some of the last-named diseases is very small:—164 in the million from chorea; and 33 from hydrophobia.

132. A chapter on the Causes of Death would be incomplete if some notice were not taken of what are sometimes called the *proximate causes* of death, or 'modes of dying.'

Death may be said to happen when the heart ceases to beat. Hence, in considering the proximate causes of death, we are inquiring by what means the pulsation of the heart may be made to stop. The first and most direct mode is by an action on the structure of the heart itself, which may be either paralysed by a nervous shock, or weakened by chronic structural disease. The second, by withdrawing, suddenly or slowly, the blood which should act as its stimulus to contraction. The third, by cutting off, more or less suddenly, the arterial blood from the left side of the heart by an impediment to the breathing. These three causes of death, or modes of dying, may be fitly termed *asthenia*, *syncope*, and *apnœa*.

133. (1.) Death by *asthenia*. The heart of a perfectly healthy person may be suddenly stopped by causes acting with great force on the nervous system: by the lightning-stroke, by strong mental emotion, by a stunning blow on the head, by a blow on the pit of the stomach, or by the shock of cold drinks. One or two active poisons, such as prussic and oxalic acid in full doses, certain poisons introduced directly into the circulation, air penetrating through an open

vein to the right side of the heart, and the sudden effusion of even a small quantity of blood on the surface, or into the substance of, the brain may also cause this sudden arrest of the heart's action. The chronic structural diseases that bring about this sudden or speedy death are fatty degeneration, which impairs the muscular tissue itself, or ossification of the arteries, which checks the supply of arterial blood to the walls of the heart. Either of these conditions may so weaken the heart, that the causes just enumerated, acting with comparatively slight force, may bring about a sudden and fatal pause in its action.

134. (2.) *Death by Syncope.*—This may be brought about either by the sudden pouring out of a large quantity of blood from a wounded or ruptured vessel, or by the slow drain of chronic hæmorrhage or exhausting discharges; the quantity of blood being so reduced, and its quality so impaired, that it ceases to act as an efficient stimulus to the heart. Ruptures and wounds of the heart destroy life partly by syncope and partly by impairing the propulsive power of the organ.

135. (3.) *Death by Apnœa.*—This is by far the most common form of death. The majority of persons die suffocated: a few by direct suffocation; a much larger number by that slow failure of respiration which attends the exhaustion of the strength by all severe diseases. Direct suffocation may be occasioned by constriction of the throat, as in hanging, strangulation, and throttling; by closing the mouth and nostrils; by pressure on the chest; by exclusion of air, as in drowning; by the substitution of a gas not containing oxygen for atmospheric air; by spasm of the glottis; by inflammation and swelling of the upper part of the larynx, caused either by hot water or corrosive poisons, or by disease; and by small foreign bodies wedged between the walls of the rima glottidis. Direct suffocation is of comparatively rare occurrence in disease. It may arise from causes affecting the larynx, or trachea, as laryngitis and croup, or from collections of blood, pus, or mucus filling up the small branches of the air-tubes and the air-cells. It may also arise from the admission of air into the pleura of one lung, the other being diseased, or from large effusion of blood or of serum rapidly poured out into the pleural sac. But, as has been just stated, the majority of deaths from apnœa are due to that gradual failure of the respiration which attends the exhaustion brought about by all severe diseases, and of which the quick laborious breathing and loud mucous râle (death rattle) are the well known indications. It is in this way that apoplectic seizures not sudden or violent enough to occasion death by *asthenia*, or shock, as well as most structural diseases of the brain, terminate.

CHAPTER III.

PHYSIOLOGY AND GENERAL PATHOLOGY.

136. THE human body is a machine of finished workmanship, and vast variety of uses, infinitely surpassing the most perfect work of man's hands; and containing within itself the means of ministering to its own growth and preservation, of repairing many injuries to which it is exposed, and of generating other machines of like structure and endowments. It is also a laboratory, in every part of which, at every moment, the most delicate chemical processes are being performed. This machine, with its exquisite mechanism and refined chemistry, is subject to change of place, to deprivation of the means of living, to violent death, or to slow decay, according to the dictates of a voluntary agent so dependent upon it, that all signs of his existence vanish before the last traces of its own vitality have disappeared.

137. All the minute structures of this machine were believed to be built up, all its movements to be regulated, and all its chemical processes carried on, under the direction of a force, acting through a machinery of its own, and manifesting its presence only by its effects. This force was called the "*vital principle.*" It was thought to be an independent entity, a ψυχη, or soul, pervading the tissues and causing them to live; and its disunion, or separation, from the body was death. But, according to a more modern theory, life is the collection of phenomena in organized beings, dependent partly on a certain structure and chemical composition, and partly on external agencies which stimulate them to action; death ensuing when the structure is seriously damaged, or the external stimuli are withdrawn.

138. On closer examination, the body is found to consist of the following parts:—A framework for locomotion and for the protection of its more important organs; a digestive apparatus for the assimilation of its food; organs of circulation for distributing the nutritious liquid blended with the pre-existing blood; viscera for the secretion of fluids destined to further uses in the economy; other viscera for the purification of the blood, constantly being contaminated by the decomposition of the effete textures of the frame; a nervous network bringing all the important internal organs of the economy into harmonious action; and a nervous mass of brain and spinal cord, the centre of sensation, volition, and thought.

139. All these parts are most closely and intimately united; so that if the heart ceased to circulate blood, or the lungs to purify it, the nervous system would no longer send forth those stimuli by which the heart beats and the chest breathes. If, on the other hand, the nervous centres suffer severe injury, respiration is prevented or impeded, and the heart soon stops. External influences also, on whatever part they act, affect not that part only, but through it other organs, and through these the entire body. Again, the mind affects the body, and the body reacts on the mind, and both together form a being so intricate yet so perfect in structure, so complex yet so plastic in function, that the preservation of its health, and the continuance of its life, appear equally wonderful with its slow decay and certain death. But experience proves that the body is so constituted that while under favourable circumstances it enjoys the free play of all its parts, under unfavourable ones it is subject to serious derangements of function and alterations of structure.

140. This brief outline will serve to indicate the following as the contents of the present chapter:—

i. The physiology and general pathology of the fluids, including digestion, chylification, sanguification, and excretion.

ii. The physiology and general pathology of the circulating organs, considered as instruments for the distribution of the blood.

iii. Structural physiology and pathology.

iv. The physiology and general pathology of the nervous system.

v. Mental physiology and pathology.

I. PHYSIOLOGY AND GENERAL PATHOLOGY OF THE FLUIDS.

141. Digestion, or the conversion of the food into chyme and chyle: the composition and properties of the blood and its constituents; and the functions and secretions of the lungs, skin, kidneys, and liver, are the subjects to be considered under this head.

142.—*Digestion.*—It is now well understood that waste of material is a condition of vital action; so that every movement of the body, every thought, every act of volition, is attended by destruction or death of certain particles of the organ concerned in the vital action. These particles being resolved into compounds unfitted to support life, are absorbed into the blood, and carried in the current of the circulation to organs destined for their separation and discharge. To supply their place is a principal use of our food.

143. In an adult arrived at full growth, in perfect health and vigour, and using no undue exertion of mind or body, the daily waste is repaired by the daily food, and the weight of the body undergoes little or no change from day to day. But this nice balance of waste and supply may be destroyed in many ways:—by increased exertion without proportionate increase of food; by still stronger exertion, the appetite remaining good, and the supply of food unlimited; or by increased exertion with diminished supply, as in training for the turf;

or, lastly, with great rapidity, by entire abstinence. In all these cases the body loses weight. On the other hand, in healthy persons, with unimpaired digestion, it gains weight by inactivity, or, within certain limits, by increase of food.

144. In certain diseases waste goes on with extreme rapidity; as in fever, when rapid destruction of the textures is combined with complete loss of appetite; in pulmonary consumption, when the local waste, added to profuse sweats or discharges from the bowels, exceeds the powers of assimilation; in tabes mesenterica, in which the diseased glands refuse to transmit the chyle; in diabetes, when mal-assimilation of the food checks the process of repair of even a moderate loss of substance; during exhausting discharges, which drain the body of its blood; and in some local diseases or injuries, attended by a loss of substance which the most nourishing diet cannot repair.

145. During the period of growth food is required not merely to supply the waste due to the destruction of parts, but to furnish new material. Hence the large consumption of food in childhood and youth in proportion to the dimensions of the frame.

146. One use of food, therefore, is to supply the waste constantly going on; and in order that it may discharge this function, it must contain all those elements, simple and compound, organic and inorganic, which exist in the structure of the body. If the food is destitute of some essential element the health sooner or later suffers. The omission betrays itself in severe functional derangements, arrests of development, or well-marked structural lesions. Water is no less essential than the food into the composition of which it enters so largely. It is the largest constituent of the body, and cannot be withheld, even for a few days, without serious consequences. The loss of this essential element entails sensations of distress far more severe than those which attend the deprivation of food.

147. The sensations of *hunger* and *thirst* warn us of this twofold waste of the solids and fluids, and invite us to repair it.

148. In healthy temperate persons these sensations bear a just relation to the wants of the frame; but there are some diseases in which they give fallacious indications, and modes of life which blunt them, or render them unduly acute.

149. A sensation of hunger disproportioned to the wants of the frame is not uncommon. It is present in certain nervous disorders, in many cases of unsound mind, in some persons who lead an indolent and inactive life, and in rare cases it reaches a point of intensity known as *Bulimia*. The appetite, again, may be unduly stimulated by condiments, and by the arts of a refined cookery. On the other hand, it may be blunted by the use of opium, tobacco, and spirituous liquors in excess, disregarded during intense mental application, or prolonged grief, and destroyed by sudden emotion. It is also impaired or destroyed in most diseases, but especially in inflammatory and febrile disorders.

150. The sensation of hunger, though usually a fair measure of the wants of the frame, sometimes deceives us as to its power of making a profitable use of food. In tabes mesenterica, for instance, the body wastes through the obstruction offered to the passage of the chyle into the blood; but, the stomach remaining sound, the appetite bears a due relation to the wants of the frame, and is often voracious. In the advanced stage of the disease, when hectic fever sets in, the appetite and digestive power alike fail.

151. The same observations hold good in respect of thirst; which may become disproportioned to the wants of the frame through the use of too stimulating a diet, salt meats, or spirituous liquors in excess. Intense thirst is also highly characteristic of the action of irritant poisons, partly due to inflammatory heat of the throat and fauces, and partly to the pressing necessity for the dilution of the poisoned blood. There is also a disease, the analogue of bulimia, known as *Polydipsia.*

152. As, in a healthy state of body the appetite is an index of the amount of food required to repair waste, so, in certain diseased conditions, does its utter failure point out the expediency of total abstinence. This is especially the case during severe febrile attacks, when, all the secretions being suppressed, and gastric juice no longer formed, digestion is rendered impossible, and indifference to food is heightened into positive loathing, or *nausea.*

153. But though hunger and thirst, in a healthy person, and under ordinary circumstances, are accurate indications of the wants of the frame, they are not so exact as to supersede the influence of habit; for experience proves that a considerable latitude in the quantity of food and in the number of meals is quite compatible with sound health. Nature does not prescribe in a manner not to be mistaken either the quantity or the time.

154. Nor is the kind of food best adapted to the wants of the frame indicated with such precision as to preclude the use of dietaries varying greatly in different climates and among different races; for though the form of the teeth is held to prove that man may partake both of animal and vegetable food, experience proves that a diet consisting chiefly or exclusively of the one or the other is consistent with perfect health and great strength.

155. There is one period of life, however, at which the diet best suited to the wants of the frame is indicated in a manner not to be misunderstood, both by absence of the means of mastication and by the supply of the food itself; namely, the period of infancy. At this period a diet differing materially from that supplied by nature is often attended by fatal results. This is one of the causes of the high mortality during infancy, and especially in the first year of life, of foundlings, of children put out to nurse, and of the children of mothers compelled to work for their living.

156. The first step in digestion consists in the cutting and bruising

of the solid portions of food by the teeth, the moistening of them by the saliva, and their propulsion into the stomach. The conditions of the perfect performance of this first act of digestion are, therefore, sound teeth, careful mastication, and sufficient saliva. Decayed teeth, and mastication imperfectly performed, either from habit, or from pre-occupation of the mind by study or business, are, therefore, very efficient causes of indigestion.

157. The saliva, as has just been indicated, serves the purpose of moistening the food; but it has also the power of promptly converting starch into sugar, and this power it exerts on part of the starchy elements of our food.

158. A portion of food thus bruised, moistened, and changed in composition, being received into the stomach, causes its muscular coat to contract, and promotes the secretion of the gastric juice. After an interval of a few seconds, the stomach relaxes to receive the next morsel. When the meal is finished, a peristaltic action of the muscular fibres sets in, commencing at the orifice of entrance (*cardia*), and extending through the entire organ, with greatly increased force and rapidity in the part nearest the orifice of discharge (*pylorus*). This peristaltic action takes place at short intervals till digestion is complete, and is such as to cause the food to rotate obliquely from above downwards, in two directions simultaneously: from the orifice of entrance by the orifice of discharge back to the entrance again. In this way the whole of the food becomes mixed, and exposed equally to the gastric juice. The part of the stomach near the orifice of discharge is meanwhile constricted, so as to form a sort of supplemental cavity, into which the fully-digested food is received, and out of which it is allowed to pass into the duodenum by occasional relaxations of the sphincter which closes the aperture of discharge.

159. The gastric juice, under the stimulus of the food, is clear, transparent, without odour, slightly salt and perceptibly acid, the acidity being probably due to free lactic and hydrochloric acids. Its essential constituent is a peculiar principle called *pepsin*. It promptly disintegrates food, converts coagulated into soluble albumen, and checks putrefaction. It is poured out rapidly, in quantity proportioned to the food; but if the food exceeds the wants of the frame and the indications of the healthy appetite, part remains undigested, and undergoing decomposition, generates carbonic acid and other gases.

160. When the food is solid or pulpy, the gastric juice acts on it almost immediately; but when liquids in excess are taken with it, they must be removed by absorption before digestion can take place; and this delay also favours dyspepsia.

161. The time required for digestion in the stomach varies in different persons, and in the same person under different circumstances; also with the quantity, quality, and consistence of the food itself, the quantity of liquid mixed with it, and the quantity of saliva. After a full meal an interval of four or five hours should elapse before taking fresh food.

162. The states of body and mind favourable to digestion are, repose and cheerfulness. Strong exercise, and anxiety or preoccupation of mind, impair the power of the stomach. Short and long intervals between meals are also injurious; the one by overtasking, the other by wearying, the organ.

163. The gastric juice, kept at the temperature of the organ and in motion, acts out of the body almost as well as in the stomach. If the temperature is much lowered, its power is greatly impaired, and when raised to 115° or 120° Fahr. is destroyed and cannot be restored. An artificial digestive fluid may be made by soaking the fresh mucous membrane of the stomach of an animal in dilute muriatic or acetic acid; and if kept at a temperature of from 99° to 100° it converts food into a substance closely resembling chyme.

164. Important facts relating to digestion, and the properties of different kinds of food, have been obtained by Beaumont, Londe, and others, who had opportunities of narrowly observing persons afflicted with fistulous openings into the stomach or small intestines. Their chief conclusions may be briefly stated as follows:—1. Animal food is more completely digested than vegetable food, is retained longer, appeases hunger more completely, and is more stimulating. 2. Vegetable substances leave the stomach with their texture only partially destroyed; and when the wants of the system are not urgent, those that are most difficult of assimilation do not begin to be digested till they arrive at the ileum, though previously fully exposed to the action of the gastric, biliary, and pancreatic fluids. In the contrary case, the digestion of these substances takes place much more promptly. 3. When animal and vegetable food are taken together the vegetable portion leaves the stomach first. 4. The more cohesive the food the longer it remains in the stomach. 5. The more nutritive the food the longer does it continue in the stomach. 6. Fatty and oily substances are most difficult of digestion. 7. Boiled meats are more easy of digestion than roast, and roast than broiled.

165. The leading constituents of the food are differently acted on by the gastric juice. Woody fibre, the husks and skins of fruit and grain, horn, hair, &c., are not digestible; albumen is dissolved and so changed as to be no longer coagulated by heat; fibrine and coagulated caseine are dissolved and partially converted into albumen; sugar of milk becomes changed into lactic acid, and starch into sugar. Fat and oil pass from the stomach unchanged, and, together with the amylaceous and saccharine matters which have not been acted on by the saliva and gastric juice, are reserved for the action of the bile and pancreatic fluid.

166. Several attempts have been made to reduce the multitudinous ingredients of our food into two or three leading classes of elementary principles. All food, whether animal or vegetable, may be said to be resolvable, in addition to water and certain inorganic matters, into three principal classes—the *saccharine*, *albuminous*, and *oleaginous*. Milk,

the nourishment provided for the young of animals, contains all these principles, and they exist in blood blended with certain effete matters.

167. This threefold division was suggested by Prout; but Liebig substituted two groups for three, and distributed all the organic constituents or elements into the *nitrogenous* and *non-nitrogenous;* the first consisting of all those substances that can be resolved into the three gaseous elements, oxygen, hydrogen, and carbon, the second embracing all those which contain in addition the element, nitrogen. The non-nitrogenous group comprises fats and oils, gum, starch and sugar, spirits, wine, and beer. The nitrogenous group contains the seeds of plants and the blood and tissues of animals, and the albumen, fibrine, caseine, and other analogous principles, that may be separated from them. The first, or non-nitrogenous group, Liebig supposed to be heat-making or respiratory, the second tissue-forming or plastic.

168. Albumen, fibrine, and caseine are constituents both of animal and vegetable matters; and they resemble each other so closely in chemical composition that if albumen, fibrine, or caseine, be dissolved in a moderately-strong solution of caustic potash, and exposed for some time to a high temperature, we obtain from it, by adding acetic acid, the same gelatinous translucent matter, which on ultimate analysis yields about 56 parts of carbon, 22 of oxygen, 16 of nitrogen, and 7 of hydrogen, in every 100,

This is the *proteine* of Mulder; of which a hundred parts, with one of phosphorus and two of sulphur, constitute albumen, as found in the serum of the blood; with one of phosphorus and one of sulphur, fibrine; and with one of sulphur, caseine. The other proximate organic principles, gelatin, chondrin, elain, stearin, margarin, hæmatosin, globulin, &c., also consist of the four elements (nitrogen, carbon, oxygen, and hydrogen), in different proportions, with or without phosphorus and sulphur.

169. The food, then, before it leaves the stomach, undergoes a twofold process of *reduction* and *conversion.* It is submitted to a chemical action, by which starch is changed to sugar, and albumen, with substances of analogous composition, is rendered soluble; and it passes, as a homogeneous pulp, under the name of *chyme*, into the duodenum, where it is largely diluted, and submitted to further chemical changes by fluids poured into it from the liver and pancreas.

170. The *bile* may be briefly described as a thin soapy fluid, which has the property of reducing fats and oils to a state favourable to absorption, of precipitating the albuminous matters previously rendered soluble by the gastric juice, and of neutralising, by its alkaline constituents, the free acid of the chyme. But when mixed with gastric juice out of the body, or when it regurgitates into the stomach, it arrests the process of digestion. It also acts as a stimulus to the intestinal canal, promoting both its secretions and the action of its muscular walls.

171. The *pancreatic fluid* seems to combine the properties of the saliva, gastric juice, and bile; for it converts starch into sugar, dissolves albuminous matters, re-dissolves the albumen precipitated by the bile, changes fatty and oily matters into an emulsion, and is, therefore, fitted to complete whatever of digestion the other fluids have left incomplete.

172. As one function of the pancreatic fluid is to dissolve fatty matters, the discovery of such matters in the stools affords a strong probability in favour of some disease of the pancreas arresting its secretion, or impeding its discharge into the bowel.

173. The action of the pancreatic fluid ends here; but the bile appears to play an important part in the economy by subserving the function of respiration; its principal constituents, *taurin*, *cholic acid*, and *glycocin*, and the sugar which has been proved to exist in the blood of the hepatic vein, being rich in carbon, and having a strong affinity for oxygen.

174. These highly-carbonised constituents of the bile in their passage through the intestines are taken up by the lacteals and poured into the stream of blood; a small part (estimated at a thirty-fourth part of the entire secretion) being rejected from the body in the fæces; while the saccharine matters in the hepatic vein pass direct into the ascending cava, enter the heart, and circulate through the lungs.

175. The fœtal liver doubtless performs analogous functions. The bile is secreted, and poured into the intestines, as in the adult: that portion which is fitted to form part of the circulating fluid is absorbed; while that which in extra-uterine life mixes with the undigested remnant of the food and other effete matters, and is periodically discharged from the bowels as *fæces*, collects in the intestines as *meconium*, and is expelled soon after birth or during delivery.

176. The bile stands alone in being secreted from blood that has already served other purposes in the economy. As the vena portæ is mainly formed by tributaries from the intestines, it suffers distension whenever their coats are congested. So that while the quantity of bile depends on the supply of blood from the intestines, the intestinal vessels are filled or emptied, and the functions of the intestinal canal promoted or hindered, by free action or torpor of the liver itself.

177. The gall-duct which conveys the bile into the duodenum also performs the part of a safety-valve to guard against the gorging of the liver and lungs with blood, as is proved by the discharges of blood that occur in extreme cases of congestion of the liver, whether connected or not with a similar state of the lungs; as also by the large quantities of bile, discharged into the duodenum and regurgitating into the stomach, or carried forward through the intestines, in certain cases of bilious vomiting and diarrhœa, in phthisis pulmonalis, and in diseases of the lungs, functional and organic. In cold climates, a sedentary life, giving little play to the lungs, conjoined with indulgence in the pleasures of

the table, leads to an increased secretion of bile, part of which passing into the intestines, doubtless tends to prevent pulmonary congestion, and part, being absorbed into the blood, tinges the conjunctiva and skin. Strong exercise in the open air, by calling the lungs into activity, lessens the necessity for the formation of bile, rapidly removes symptoms of indigestion, and restores the natural clearness of the complexion. In hot climates again, the demand upon the lungs for the combustion of the carbon and hydrogen of the blood being diminished, if more nourishment be eaten than is required, bile is formed in increased quantity. In either case (whether in cold or hot climates), habitual excess in eating and drinking, and especially the free use of the liquid hydro-carbons (the several forms of spirituous liquor), leads to the same result—functional or organic disease of the liver.

178. The intermediate position of the liver—between the lungs (through the right cavities of the heart), and the intestines (through the vena portæ), accounts for the frequency of functional and organic diseases of the liver, which occur as indirect consequences both of pulmonary and of intestinal disorders.

179. The chemical process of digestion carried on successively by the saliva, the gastric juice, the bile, and the pancreatic fluid, is not completed in the duodenum, but continues throughout the small intestines, and is probably finally completed in the cæcum by the solution of the last undigested portions of vegetable matter.

180. As the food blended with the secretions of the mouth, stomach, liver, and pancreas, passes through the long tract of the small intestines, its nutritious portions are removed by the lacteals, and the residue passes into the large intestines, from which, after the absorption of some of its liquid constituents, it is discharged as *fæces*, amounting in quantity to about 1–18th part of the food taken.

181. The indigestible part of the food mixed with the residuum of the bile, forms the natural stimulus to the movements of the intestinal canal; an excess of bile increasing the peristaltic action, a deficiency of it, whether through diminished secretion or obstructed flow, causing constipation. In like manner, an excess of undigested or ill-digested matters, produces diarrhœa; and the absence of all indigestible matter, one of the evils of an over-refined cookery, causes constipation. The passage of the fæces through the intestines is also greatly promoted by the movements of respiration, and by all exercises in which the abdominal muscles are called into play. Sedentary habits, on the contrary, promote constipation.

182. Of the two parts into which the chyme is separated, viz., chyle and fæces, the chyle is absorbed by the lacteals, and conveyed into the thoracic duct, where it mixes with the lymph collected from all parts of the body by the absorbents. This mixed fluid, after undergoing changes in its course through the lacteals by which the quantity of albumen is greatly increased, is poured into the left sub-

clavian vein, and becomes part of the blood. The absence of these changes is supposed to lead in children to obstruction of the mesenteric glands, and, later in life, to the deposit of an imperfect albumen mixed with fatty or earthy matters, constituting scrofulous matter, tubercle, and other morbid deposits.

183. To the changes which the food undergoes from its reception into the stomach till it is mingled, in the form of chyle, with the blood, Prout gave the name of *primary assimilation.* Those that take place in the capillaries during the formation of new parts, and the conversion of effete structures into lymph; and those also which the contents of the absorbents themselves undergo, he called *secondary assimilation.*

184. Both these processes may be imperfectly performed. In the primary process some one constituent of the food may be imperfectly acted on. The mal-assimilation may be limited to the saccharine principles (sugar and lactic acid, starch and gum) causing the formation of sugar, which finds its way into the blood and urine in diabetes; of oxalic acid, which, in union with lime, constitutes the oxalate of lime, or mulberry calculus; and of lactic acid, which abounds in rheumatic and hectic fevers, and is probably the chief ingredient in the acid liquors discharged from the stomach in dyspepsia. Mal-assimilation of the albuminous principles (albumen, gelatin, fibrin, and gluten) may lead to an excess of albumen, conveyed into the blood and eliminated by the kidneys, and to the formation of lithic acid and cystic oxide calculi; that of the allied gelatinous principles leads to an excess or deficiency of urea, or of its equivalent, carbonate of ammonia; while the mal-assimilation of the oleaginous principle leads to a deficiency of fat in the frame, or leanness; and an unusual power of assimilating this principle, to corpulence.

185. These forms of mal-assimilation are inferred to exist, not so much from the analysis of substances rejected from the stomach, or contained in it after death (though sugar has been found in the stomach in excess in cases of diabetes), as from discovering the products of such mal-assimilation in the blood and urine.

186. The precise nature of the changes that take place in the capillaries and in the absorbents (*secondary assimilation*) cannot be determined by direct observation, but must be inferred from the composition of the blood, on the one hand, and of the various excretions on the other. In the formation of the several secretions and structures of the body, the blood is robbed of some of its chief constituents, such as fibrin, albumen, and salts, while, on the other hand, it is tainted by the products of the destruction of the effete and useless parts of the frame, containing many new principles destined for removal by the excreting organs, and which, if not so removed, act as poisons, and give rise to serious diseases.

187. The principal structures of the body are the *albuminous* and the *gelatinous.* The *albuminous* structures which in health are re-

solved into lithate of ammonia, when mal-assimilated give rise to lithic acid gravel, and perhaps to certain poisonous combinations of cyanogen. During this imperfect assimilation certain diseases of the albuminous tissues are supposed to arise. The *gelatinous* tissues which in health are resolved into lactate of urea, when mal-assimilated, are converted into sugar and urea, or into oxalic acid and urea, the urea being replaced in either case by carbonate of ammonia. The mal-assimilation of these textures also leads to certain diseases of the skin, and to destructive suppuration of the cellular tissue.

188. The food has now been traced through the successive mechanical and chemical processes of digestion to its mixture, as chyle, with the mass of the circulating fluid. How the milk-white contents of the thoracic duct are converted into red blood, or, to speak more precisely, how the red globules which are superadded to its colourless constituents are formed out of the materials supplied by the lymph, is not exactly known. It has, however, been shown that the lymph itself contains lymph-corpuscles differing from the red particles chiefly in colour, and probably destined to form the groundwork of them.

189. *The Blood.*—This fluid, as it circulates in the vessels, is of very mixed character, for it is being constantly renovated by chyle derived from the food, and contaminated by lymph absorbed from the tissues; so that it contains all the materials required for their formation, nourishment, and growth, and also all the new elements into which they are resolved when no longer fit to form parts of the living frame.

190. The quantity of blood in the body of an adult has been variously estimated at from 8 to more than 30 pounds. The quantity which can be made to flow from the corpse of a decapitated criminal, added to that which can be washed out of its vessels, is about an eighth of the weight of the body itself. This, the highest ascertained proportion, would give 20 pounds of blood for an adult weighing 160 pounds. The quantity must, however, be subject to variation. It is at its maximum within a few hours of a hearty meal, at its minimum after long abstinence.

191. The specific gravity of the blood is about 1055. It may reach 1059 in robust men, and fall as low as 1050 in women; in pregnant women as low as 1045. It is also low in very young infants. Its temperature is about 100° Fahr. Its colour a bright red in the arteries, and dark red in the veins. It is fluid when circulating in the living textures, but coagulates in from three to seven minutes after removal from the body.

192. The blood consists of red particles or corpuscles, to which it owes its colour, of colourless finely granular cells (white corpuscles) and of transparent colourless serum, holding fibrine in solution, and known as *liquor sanguinis* or *plasma*. The red corpuscles which

form half its bulk have the high specific gravity of 1088. The white corpuscles bear to the red the proportion of 1 to 100.

193. The blood in coagulating separates into two parts, the crassamentum, or clot, and serum. The clot is formed by coagulated fibrine enveloping the red and white corpuscles and part of the serum; and its consistence depends on the relative quantity of these constituents. When the fibrine is large in proportion the clot is firm; when there is much serum, it is loose.

194. When blood-letting was being constantly employed as a remedy, it was usual to examine the blood, with a view to ascertain the state of system in which the remedy had been prescribed; and certain appearances in the clot were held to prove the existence of inflammation. The importance of this procedure has diminished as a resort to the lancet has become less common; but the phenomena of coagulation still merit attention.

195. The appearance supposed to indicate inflammation, to justify the past abstraction of blood, and to warrant a fresh recourse to the lancet, was a concave and buff-coloured clot. When it presented both these characters, it was said to be *buffed* and *cupped.*

196. Healthy blood drawn from a vein, and suffered to remain at rest, undergoes two principal changes, the subsidence of a portion of its red particles, and a coagulation of the mass of the fluid. The red particles begin to subside as soon as the blood is drawn: coagulation rapidly follows, and in about ten minutes converts the blood into a loose jelly. The blood, thus transformed from a homogeneous fluid into a nearly homogeneous solid, undergoes a further change, often not completed within twenty-four hours, or even more. This consists in the progressive contraction of the fibrine in the lower part of the mass, so as to entangle the red and white corpuscles, and press out the serum. Hence, the upper layer of the clot contains no red particles, but consists wholly of the buff-coloured liquor sanguinis, hollowed or cupped by the strong contraction of the fibrine; and as the lower portion, which consists of fibrine and red particles, is larger and looser, the outline of the clot is not unlike a cupping-glass.

197. From this statement it follows, that the size, shape, and colour of the clot may be influenced by more causes than one. If the red particles retain their natural specific gravity, while that of the liquor sanguinis is diminished, or if they have a greater specific gravity than usual, whilst the liquor sanguinis has its normal density, or, again, if they have an unusual tendency to coalesce and adhere (as has been shown to be the case in inflammation), they will sink rapidly, and the separation between the upper and lower parts of the clot will be complete. The opposite conditions of the two portions will, of course, produce opposite results. Again, the contractility of the fibrine being the same in two cases, if the quantity is increased in the first and lessened in the second, the clot will be large in the one, and small in the other.

If, the quantity of fibrine remaining the same in two cases, the contractility is great in the first and small in the second, the cupped appearance will be present in the one, but absent in the other. The thickness of the buffed surface will depend on the quantity of the liquor sanguinis separated from the rest of the clot; which, in its turn, will vary with the time that elapses before the fibrine begins to contract. The slower the coagulation, therefore, the thicker the buffy coat. Again, a great diminution in the quantity of the red particles would favour the complete separation of the liquor sanguinis, and give rise to the buffy coat.

198. The separation of the liquor sanguinis and the degree of contraction of the fibrine are influenced by many causes, such as the size of the stream, the depth of the vessel, the temperature of the blood itself, and of the place in which it is kept, its exposure to the air, and even the shape of the vessel into which it is drawn.

199. In the experiments of M. Andral and others, a cupped and buffed appearance of the blood has been observed in diseases unaccompanied by inflammation, as in chlorosis, in which disease it was present in sixty-four per cent. of the cases.

200. The buffy and cupped coat, then, is no sure indication of inflammatory action, but only of an alteration in the relative quantities of the fibrine and red corpuscles, or an excess, either absolute or relative, of the fibrine.

201. The quantity of the *crassamentum*, or clot (the combination of fibrine and red globules with a variable proportion of serum) varies within wide limits; the blood of men being more rich in the chief constituents of the crassamentum (fibrine and red corpuscles) than that of women: and in persons of the sanguine temperament than in the lymphatic.

202. The quantity of *red corpuscles* differs in different persons at different times, and it probably varies with age, sex, temperament, and state of health. According to Becquerel and Rodier, it ranges between 113 and 152 parts in a thousand; the average for healthy males being 141, and for healthy females 127.

203. The red corpuscles are biconcave discs, consisting of a capsule, inclosing a homogeneous, faintly granular, semi-fluid, red-tinted substance. When the blood is mixed with water the particles swell by imbibition; but if mixed with syrup, or a liquid of greater specific gravity than the blood, they shrink and become puckered from the exsudation of their liquid contents. It is probable, therefore, that by swelling when the specific gravity of the blood is reduced, and shrinking when it is increased, the red particles may serve to maintain a more uniform consistence of the circulating fluid.

204. The red corpuscles are variously affected by chemical agents and by some of the secretions. The bile completely dissolves them.

205. The *fibrine* in healthy blood varies from 1½ to 3½ parts in a thousand, the average being 2⅓. It is more abundant in arterial than in venous blood, in about the proportion of 5 to 4.

206. The *serum* is a straw-coloured fluid, holding albumen in solution. When heated to 167° Fahr., the albumen coagulates, and separates, and this change takes place equally when the serum is mixed with other liquids, such as the urine: so that heat detects the presence of serum in the urine, and the existence of a certain form of disease of the kidney.

207. The fluid remaining after the separation of the albumen is called the serosity. It consists of extractive matters and inorganic salts (principally of soda) dissolved in water.

208. The several constituents of the serum vary with sex, age, and temperament. The quantity of *water* is greater in females than in males; in children and aged persons than in persons of middle age; and in the lymphatic temperament than in the sanguine. In healthy males it has a range of from 760 to 800 parts in a thousand, and an average of 779; and in healthy females, a range of 773 to 813, with an average of 791. The *albumen* ranges from 62 to 75 parts in a thousand, the average being about 70.

209. Besides the constituents just mentioned, the blood contains, in minute quantity, a variety of matters destined to be removed from the body by the excreting organs, especially the kidneys. When these excretions are checked, these matters accumulate in the blood, and may be detected by chemical reagents.

210. The blood undergoes various changes in disease:—(*a*) Sensible changes; (*b*) Variations in the proportions of its constituents; (*c*) Admixture of substances foreign to its healthy composition.

211. (*a*) *Sensible changes.*—The *quantity* of blood is increased by taking food and in plethora, and diminished by hæmorrhage and abstinence. It is also said to be diminished in anæmia; but the pallor which characterises that disease may be explained by a deficiency of red corpuscles. Its *temperature* is increased in diseases accompanied by a rapid circulation, such as severe inflammations and inflammatory fevers: on the other hand, it is lowered in languid states of the circulation, and especially when the blood is imperfectly decarbonised, as in apnœa, poisoning by prussic acid, cholera, and cyanosis. The *colour* of the blood is more florid in the cases in which its temperature is raised; and darker in those in which its temperature is lowered. It is changed from dark blue to black by contact with acids, whether formed in the body itself or introduced from without; and it has been described as having a glimmering blue tint in some cases of poisoning by prussic acid.

212. (*b*) *Variations in the relative proportions of its constituents.*—The *red corpuscles* are in excess in plethora, and in defect in anæmia. The white corpuscles abound in anæmia. They are slowly reproduced:

hence the long continuance of pallor after hæmorrhages. The *fibrine* is increased in acute inflammations, especially of the serous membranes, in acute rheumatism, pneumonia, phthisis, erysipelas, cynanche tonsillaris, and absorbent inflammation. The greatest increase takes place in acute rheumatism, being sometimes nearly three times as great as in health, and continuing in excess after repeated bleedings. It is also in excess in the pregnant female. On the other hand, its quantity is diminished in fevers which are not inflammatory, in cerebral congestions and hæmorrhages, in scurvy, in profuse hæmorrhages, and in inflammation of the mucous membranes. The quantity of the *serum* increases as that of the *clot* diminishes. The quantity of *water* in like manner increases as that of the more solid ingredients decreases. It is in excess in anæmia, and in chronic exhausting maladies. The *albumen* probably bears a near proportion to the fibrine: it is greatly diminished in cases of Bright's disease. The *salts* of the serum are diminished in typhoid fever, and in cholera morbus.

213. These facts are stated chiefly on the authority of Andral and Gavarret,* to whom we are indebted for the following table of the variation observed in the quantity of the chief constituents of the blood in disease, compared with the average in health.

Fibrine varies between	10·5 and	0·9 per 1000 parts—average in health	3
Globules . . .	185	21	127
Solid matters of serum	114	57	80
Water . . .	915	725	790
Inorganic matters of serum . . .	8	5	8

214. (*c*) *Admixture of substances not found in healthy blood.* 1. Results of mal-assimilation of the food. 2. Elements of the natural secretions and excretions. 3. Morbid secretions of the blood itself; and 4. Poisons introduced from without

215.—1. Sugar is sometimes found in undue proportion in the blood as the result of mal-assimilation in the stomach, and oxalic acid found in combination with lime in the urine, is presumed to have existed as such in the blood itself. 2. The elements of the secretions and excretions accumulated in the blood, in consequence of disease of the excreting organs, or of their excessive production during primary and secondary assimilation, are chiefly the following: urea, lactic acid, fatty matter in excess, colouring matter of the bile, cholesterin, free carbonic acid, and casein. 3. Of the morbid secretions of the blood itself, the chief is pus, which, under certain circumstances, is absorbed from the veins or from suppurating surfaces, and carried into the circulation. 4. Poisons introduced into the stomach, by wounds, or by the unbroken skin, find their way into the blood, and may be detected there by appropriate tests.

216. The constituents of the blood may be separated and thrown out among the textures of the body, or on the surface of membranes, or

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* Annales de Chimie et de Physique, Nov. 1840.

discharged by the several outlets. Fibrine plays an important part in every process of reparation; water and serum are formed in the sacs of serous membranes, and in the cellular tissue; and the red corpuscles escape in peculiar states of debility. In inflammation, accompanied by loss of substance, a new liquid (pus) is formed.

217. The chyle and lymph which are constantly being added to the blood bring with them many useful and some hurtful principles which must be discharged from the body. The principal organs by which this is effected are the *lungs*, *skin*, *kidneys*, *liver*, and *intestines.*

218. *Respiration.* The air-tubes, after repeated divisions and subdivisions, terminate in small vesicular cells, on the walls of which a network of minute blood-vessels is distributed. The membrane of these cells, through which the atmosphere acts on the blood, is believed to be at least thirty times as extensive as the surface of the body. The lungs, therefore, constitute one vast excreting surface, from which there constantly escapes into the air a mixed cloud of carbonic acid gas and water. An interchange of carbonic acid and oxygen takes place through the membrane of the cells, by which the one is released and the other absorbed, the absorption of oxygen changing the colour of the blood from dark blue to light red.

219. Viewed as excreting organs, the lungs have this peculiarity, that they require for the due performance of their functions the contact and constant renewal of atmospheric air. This is brought about by the alternate expansion and contraction of the walls of the chest, coinciding with the depression and elevation of the diaphragm, which movements in healthy and well-formed adults are repeated about eighteen times in a minute.

220. The lungs are always expanded by air. After ordinary expiration, it is believed that as much as 108 cubic inches of air remain; and it is probable that the quantity subject to change does not exceed 15 cubic inches. At this rate, if we suppose the number of respirations to be twenty in the minute, no less than 432,000 cubic inches, or 250 cubic feet, of air will be required to support the function of respiration during twenty-four hours. But if the body were to remain at rest during the whole of that time, the consumption of air would not be so great.

221. But from a calculation based on the assumption that 10½ ounces of carbon are eliminated from the lungs and skin of an adult male in twenty-four hours, it may be inferred that the quantity of air required during that time (no portion being used more than once), falls little short of 2000 cubic feet; so that if a man were shut up in a perfectly close apartment, opened only once every twenty-four hours, he ought to have that space allotted to him. On the same principle, a close bedroom occupied during a night of eight hours, ought to have nearly 700 cubic feet of air for each adult male occupant. This space may be safely curtailed where sufficient ventilation is practised; but the space

allotted to each adult during twelve hours, whether by day or night, ought not to fall greatly short of 1000 cubic feet, that is to say, a cube 10 feet in every dimension. In buildings for the reception of the sick, this quantity should be increased at least one half. In apartments occupied for shorter spaces of time, 75 cubic feet per hour would be a sufficient allowance. The quantity may be reduced in the case of adult females and young and aged persons of either sex; and a less amount will suffice in hospitals and public establishments in the country than in similar institutions in large towns.

222. The air drawn into the lungs at each inspiration has been just taken at 15 cubic inches; but this is probably too low an estimate. Vierordt found that, in his own person, the quantity at one time was nearly five times as great as at another, the minimum being 11, an average of the maxima 43, and the mean of all his observations 31; and Valentin, by experiments on young adult males, whose respiration was tranquil, or only somewhat quickened, obtained a minimum of 14, a maximum of 95, and a mean of 40 cubic inches. The principal experimenters on respiration give estimates or measurements founded on experiment, ranging from a minimum of 12 cubic inches (Goodwyn and Abernethy), to a maximum of 40 cubic inches (Turin and Menzies).

223. According to the lowest estimate, the carbonic acid formed in twenty-four hours amounts to 14,930 cubic inches, or 8,534 grains; according to the highest, to 39,600 cubic inches, or 18,612 grains. The mean of the three estimates (Lavoisier and Seguin, Davy, and Allen and Pepys) is nearly 28,736 cubic inches, or 14,985 grains. The quantity of carbon removed from the blood will therefore be, according to the lowest estimate, 2,820 grains, according to the highest, 5,148, and the mean of the three estimates will give 4,273 grains, or nearly 10 ounces avoirdupois. This estimate falls short by a quarter of an ounce of that given by Dalton. Liebig found that an adult taking moderate exercise expires daily from the lungs and skin an average of 13·9 ounces of carbon.

224. Air once respired contains nearly 5 per cent. carbonic acid; but however frequently the same air is breathed, it never contains more than 10 per cent. The respired air is diminished by about $\frac{1}{24}$th of its volume; probably through the absorption of oxygen. When pure oxygen is breathed, the carbonic acid given off from the lungs is increased.

225. Prout's experiments show that more carbonic acid is generated in a given time between 11 A.M. and 1 P.M. than between 8½ P.M. and 3½ A.M.; and more during the day than at night. Less carbonic acid is formed in females than in males; in young and old than in middle-aged persons. It is increased by repletion and exercise, lessened by fasting and rest. It is also diminished by depressing passions, by fatigue, by spirituous liquors, tea, or vegetable food, and by the long-continued use of mercury. It is also given off in larger quantity when the barometer and thermometer are low.

226. The water exhaled from the lungs in twenty-four hours amounts, according to different estimates, to from 2,880 to 13,704 grains, or from about 6½ ounces to 1 pint 11 ounces.

227. The chief function of the lungs, then, is to free the blood from carbonic acid and water. The separation of carbonic acid, and the absorption of oxygen, are necessary to enable the blood to nourish the body, and to act as the efficient stimulus to all its functions. The suspension of breathing for a few minutes is fatal to life, and the circulation of blood not purified by respiration has an injurious influence on all the organs, but particularly on the nervous system.

228. The carbonic acid exhaled from the lungs is greatly increased in the first stage of small-pox, measles, and scarlatina, as well as in various chronic diseases of the skin, but it is diminished in typhus fever.

229. The lungs also serve as channels through which many volatile matters taken into the stomach escape almost unchanged; and the sweet breath of some healthy persons and the tainted breath of cachectic patients proves that those organs may also serve as avenues through which volatile matters formed within the system, and circulating with the blood, find their way out of the body. Bernard's experiments also prove that sulphuretted hydrogen introduced into the circulation escapes from the body through the lungs.

230. *The Sweat.*—The *Skin* performs two important functions; it separates from the blood matters which would be injurious if retained in it, and it regulates the heat of the body by the discharge of water. The chief constituents of the sweat are carbonic acid, nitrogen, ammonia combined with lactic acid (according to some, with acetic acid), urea, and a variety of salts.

231. The carbon eliminated by the skin in twenty-four hours amounts, according to Dalton, to a quarter of an ounce, being but a small fraction of that given off from the lungs. Sometimes carbonic acid is exhaled with nitrogen, sometimes nitrogen alone is given off, and at others neither of them is present. The quantity of these gases also varies considerably with the quantity of food and the amount of muscular exertion. Nitrogen is most abundant after animal, and carbonic acid after vegetable, food.

232. The exhalation from the skin amounts, according to Dalton's estimate, to 6¾ ounces in twenty-four hours. The more accurate experiments of Seguin give 7 grains per minute in a male in a state of rest, or little less than 1½ lb. in twenty-four hours.

233. The aqueous exhalation is partly mere evaporation, and partly a secretion. The *evaporation* is due to common physical causes, and is increased by a dry and warm atmosphere, by air in motion, and by diminished pressure of the air; lessened by moist and still air, and by increased atmospheric pressure. The *secretion* is increased by moderate excitement of the circulation, and diminished by rest.

234. The perspiration is *diminished* when other secretions are greatly increased: thus the skin is dry in diarrhœa, diabetes, cholera, and dropsy. It is also diminished in the cold stage of intermittent and continued fevers, and at the commencement of all febrile affections, as well as in acute inflammations, in the hot stage of fever, and in the febrile exanthemata. In the first class of cases a small quantity of blood circulates through the vessels of the surface; in the second, the circulation is increased beyond the secreting point.

235. On the other hand, the perspiration is *increased* in the sweating stage of intermittent fevers; in mild continued fevers; in catarrhal and miliary fevers; and in inflammatory affections of moderate severity. It is also increased whenever determination of blood to the skin is combined with debility of the capillaries, as in the hectic fever of phthisis pulmonalis and other exhausting maladies. In extreme debility, again, the perspiration is augmented through the weakness of the capillary vessels, though the quantity of blood circulating through them is diminished. Such are the cold sweats of the dying. The perspiration is also very abundant in acute rheumatism, and in hypertrophy of the heart.

236. The *odour* of the perspiration appears to be compounded of a sourness due to lactic and acetic acids, and of a peculiar animal odour perceptible in bedrooms, in rooms recently occupied by bodies of men, and in most persons after laborious exertion. The sour odour predominates in some, the animal odour in others. The first is heightened in catarrhal, rheumatic, and arthritic diseases, in childbed, and in intermittent fevers; the last in pulmonary consumption, and in many persons of unsound mind.

237. Sweats are sometimes partial, as in phthisis; sometimes general, as in the sweating stage of fevers; and partial sweats pass into general ones.

238. Remedies act on the skin chiefly through the circulation, some by diminishing, others by increasing the heart's action. The passions of the mind also affect the secretion from the skin, by exciting or depressing the action of the heart, agreeable emotions producing a warm moist glow, the stronger depressing emotions, copious cold perspirations.

239. *The Urine.*—The kidneys subserve the twofold purpose of relieving the system of excess of water, and of removing (in suspension or solution) solid matters which have been taken as food, or have resulted from the disorganization of the nervous and muscular tissues. These last occur under the form of urea and uric acid, and certain sulphates and phosphates. The urine is also the channel for the removal of medicines and poisons.

240. The quantity of urine excreted in twenty-four hours varies according to the activity of the skin: 48 ounces is about the average. Whatever be the quantity, it should contain about 1 ounce of urea.

241. The most important constituents of urine are water, urea, and uric acid. The two latter ingredients consist of the following elements:—

	Nitrogen.	Carbon.	Oxygen.	Hydrogen.
Urea ..	47 ..	20 ..	27 ..	7
Uric acid ..	31 ..	40 ..	27 ..	2

Urea and uric acid, therefore, contain so large a proportion (urea nearly fifty per cent.) of nitrogen, that they are the principal means by which this gas is eliminated from the system. They vary with the quality of the food, being increased by animal and diminished by vegetable diet; they are almost absent in infants at the breast; and go on increasing towards manhood.

242. The quantity of the urine is increased by the suppression of other secretions, and lessened by their increase: and this is specially true of the cutaneous exhalation. As the urine attracts special attention at the bedside, it will be more minutely examined in the next chapter.

243. *The Bile.*—This secretion has been well described as a soapy solution of two peculiar fatty acids combined with soda, forming the so-called glycocholate and taurocholate of soda. These, dissolved in about nine times their weight of water, constitute about nine-tenths of the solid constituents of the secretion, every hundred parts of which contain 64 of carbon, 9 of hydrogen, 3 of nitrogen, and 24 of oxygen. The quantity of bile formed in twenty-four hours has been estimated at from 17 to 54 ounces. If, in the absence of precise data, we take the quantity at one pint, and suppose it to weigh 9000 grains, it follows that, as the solid constituents form one-tenth of the entire secretion, their weight will be about 900 grains. As, again, nine-tenths of these solid constituents consist of taurocholic acid, it follows that about 810 grains of this substance are secreted daily. Now 64 parts in 100, or rather more than three-fifths of this, consist of carbon. This will give for the carbon contained in the bile nearly 520 grains; and as the bile daily voided with the fæces does not weigh more than a scruple, upwards of an ounce of carbon must find its way into the intestines, to be absorbed and carried into the circulating system as prepared fuel for the lungs (§ 170, *et seq.*). Hydrogen, to the amount of about a seventh of this quantity, would have to be similarly disposed of.

244. The glandular structures of the intestines, especially those in and near the cæcum, evidently bear a part in freeing the system from noxious matters, though, from the nature of the case, it is not possible to assign their precise function. Their inflamed and diseased condition in typhoid fever, and under the fatal operation of such poisons as arsenic, mercury, and antimony, coupled with the fact that, in poisoning by the last-named substance, they have been found to contain it in large quantity, justify us in classing these intestinal glands among the most important of the excreting organs.

245. By the lungs, skin, kidneys, liver, and bowels, the blood is freed from useless or hurtful matters. The excretions of these organs have been examined separately; but it will be useful to consider them collectively, in order to show what share each bears in removing effete matters from the blood.

246. An average of fourteen experiments made by Dalton on his own person, on successive days in the month of March, gave the following results, the urine and fæces being ascertained by weight, and the secretions of the skin and lungs by calculation.

The ingesta weighed 91 ounces. The egesta were as follows:—

Urine 48½ oz.; exhalation from the lungs and skin 37½ oz. (30¾ oz. by the lungs, and 6¾ oz. by the skin); fæces 5 oz.: or, more than half by the kidneys; a third by the lungs; a thirteenth by the skin; and an eighteenth by the bowels.

247. The bulk of these excretions, and consequently of the food and drink by which they are supplied, consists of water. Of the 91 ounces, no less than 76 consisted of water, which was contained in the several excretions in the following proportions:—

Urine 45¼ oz.; lungs 20½ oz.; skin 6½ oz.; fæces 3¾ oz. Total, 76 oz., or, about five-eighths by the kidneys; a fourth by the lungs; a twelfth by the skin; and a twentieth by the bowels.

248. The separation of water is evidently an important use of these excretions, and it is easy to understand how one of these organs may become vicarious of another in this respect. Thus, when the exhalation from the skin is increased by exercise or by any other cause, the urine is diminished; when, on the other hand, as in diabetes, the flow of urine is increased, the skin becomes dry and harsh. The functions of the lungs and skin are also closely connected. When, during exercise, the skin is moist, the respiration is free; but if, the skin being dry, the circulation is at the same time excited, the respiration is oppressed; but the moment moisture breaks out on the skin, the lungs are relieved as by a charm, and respiration becomes natural and easy. The pedestrian will recognise the truth of this statement. It is the rationale of the "second wind" of those who take strong exercise.

249. The quantity of water removed by the bowels being comparatively small, has little effect on the other secretions; but if increased by the operation of a purgative, the urine is diminished, and in violent diarrhœa, and in cholera especially, is often entirely suppressed. The exhalation from the lungs is also probably affected by the quantity of the secretions poured out by the other organs.

250. Next to the water thus removed from the system, the most abundant material is carbon. It is eliminated by the different organs in the following proportions:—

Lungs 10¼ oz.; skin ¼ oz.; urine ½ oz.; fæces ½ oz. Total, 11½ oz. Hence the blood is purified of its carbon by the lungs, kidneys, skin, and liver. Of these the lungs excrete so much the larger proportion, that no single organ, nor all jointly, can supply their place when their functions are much embarrassed. Some of the carbon contained in the fæces is furnished by the bile. The rest has never formed part of the circulating fluid.

251. The lungs and skin excrete carbon with oxygen, as carbonic acid; the kidney, with nitrogen and oxygen, and a small proportion of hydrogen, as urea and uric acid; and the liver, with oxygen, hydrogen, and comparatively little nitrogen, as cholic and glycocholic acids. As the carbon is similarly combined in the secretions of the lungs and skin, it is easily seen how the functions of the skin may become vicarious of those of the lungs. The relief afforded to the lungs during exercise by free perspiration probably arises in part from the excretion of carbonic acid; and the same may be said of the colliquative sweats in phthisis.

252. The close relation existing between the functions of the liver and lungs is proved by the frequent coexistence of diseases of those organs: that the one may be vicarious of the other is shown by the large size of the liver in the fœtus.

253. The essential constituent of the urine (urea) contains carbon in considerable quantity. It is directly derived by oxidation from uric acid, which contains twice the quantity of carbon, and is regarded as a product intermediate between the effete nervo-muscular tissues on the one hand, and urea on the other. Disordered function of the lungs or skin leads, therefore, to the accumulation of uric acid in the system.

254. Nitrogen is at one time absorbed, at another exhaled, by the lungs, also by the skin in variable, but probably not in large quantity; but it is nearly absent from the bile. The appropriate organ for its removal from the system is the kidney. In what degree other excretions may be vicarious of the kidney in this respect is not yet known. In uræmia the stomach attempts the elimination of urea.

255. The secretions of the skin, kidneys, and liver abound in salts; one of these organs may, therefore, to a certain extent, become vicarious of another in their removal from the system. Certain saline substances are accumulated in large quantity in diseased organs at the expense of some secretion of which they form a normal constituent. Thus common salt, found in excess in the sputa from hepatized lungs, but absent from the urine, is restored to the urine on the subsidence of the disease, as has been shown by Dr. Beale.

256. In the similarity of the matters excreted by the several organs, we recognise a provision for maintaining the normal constitution of the blood under the less severe functional disorders; while the efforts made by one organ to supply the place of another, probably account for some of the more familiar symptoms of disease. When these efforts are unavailing, the constitution of the blood becomes seriously altered, to the imminent danger of the patient.

257. The following table presents at one view the results of Dalton's experiments; the last three lines being rude approximations:—

	Pulmonary Exhalation.	Cutaneous Exhalation.	Urine.	Fæces.	Total.
Egesta	30¾oz.	6¾oz.	48½oz.	5 oz.	91 oz.
Water	20½oz.	6½oz.	45½oz.	3¾oz.	76¼oz.
Solid residue.	10¼oz.	¼oz.	3 oz.	1¼oz.	14¾oz.
Consisting of substances containing—					
Carbon	10¼oz.	¼oz.	½oz.	½oz.	11½oz.
Nitrogen and other gaseous elements of urea and uric acid, exclusive of carbon			1½oz.	..	1½oz.
Salts, &c.			1 oz.	..	1 oz.
Residue of undigested matters				¾oz.	¾oz.

258. In the foregoing statement and tabular summary no notice is taken of the large quantity of oxygen received through the lungs. This gas, as essential to the support of the frame as food itself, by uniting with the effete textures, gives rise to compounds which cannot support life, and these being absorbed into the current of the circulation, seek their exit from the body through the excreting organs. If we suppose the weight of the body to remain unchanged, the oxygen introduced by the act of respiration, added to the food consumed, must equal in weight the matters rejected by the excreting organs. The part borne by each organ in this work of elimination is shown in the following table, which embodies the figures of two tables given by Vierordt in his 'Grundriss der Physiologie,' p. 192. 3952 grammes of food and drink are resolved into their elements, and traced, so to speak, into the excretions through which they pass from the body.

Received as Food.		Excreted by				
		Lungs	Skin	Kidneys	Bowels	?
Water in food and drink	2,818	330	660	1,700	128	..
Oxygen (from air 744, from food 38)	782	651	7	11	12	101
Hydrogen from food	19	..	..	3	3	13
Carbon ,,	282	249	3	10	20	..
Nitrogen ,,	19	..	..	16	3	..
Salts ,,	32	..	..	26	6	..
	3,952	1,230	670	1,766	172	114

With the exception of 101 parts of oxygen and 13 of hydrogen, supposed to unite as water, the watery, gaseous, and saline elements of the food are here traced to the organs by which they leave the body. It is worthy of remark that in the experiments from which these figures are deduced, the oxygen received in respiration is little less than a fifth part by weight of all the solid and liquid matters taken as food, and very nearly twice as great as the oxygen, carbon, hydrogen, nitrogen, and saline matters contained in all that part of the food that is not water.

2. PHYSIOLOGY AND GENERAL PATHOLOGY OF THE CIRCULATING SYSTEM.

Having now examined the function of digestion; the blood, and its constituents; the secretions destined to further uses; and the excretions by which the blood is freed from useless or hurtful matters;—it remains to consider the mechanical arrangements by which the blood is renewed, purified, and distributed through the frame: in other words, to examine the functions of absorption, secretion, nutrition, and circulation. This will be done in the following order:—the action of the heart; the motion of the blood in the arteries; the functions of the capillaries, of the veins, and of the absorbents.

259. *The Circulation.*—The heart is the centre of two incomplete circulations; one through the lungs, beginning at the right ventricle, and ending at the left auricle; the other through the body, commencing at the left ventricle, and ending at the right auricle; the two together forming a complete circulation, an uninterrupted stream of blood. A third circuit consists of the coronary arteries springing from the commencement of the aorta, and the coronary vein opening into the right auricle.

260. These three incomplete circulations consist of vessels, all of which are always, and in all states of the living body, full of blood, though more or less distended as it is increased or lessened in quantity.

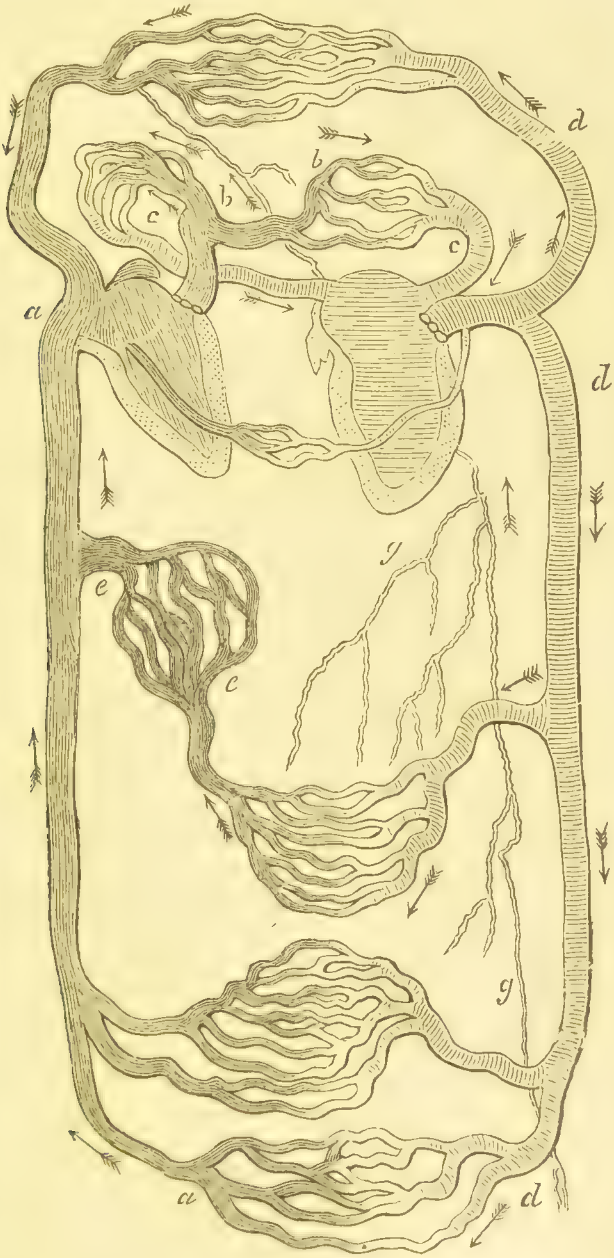
261. The vessels in question consist of an arterial trunk split into numerous small branches, of a venous trunk formed by the union of equally numerous small veins, and of capillary vessels uniting the two, and this—arteries dividing into small branches, and corresponding small veins uniting to form venous trunks—is, with the exception of the vena portæ, and the minute vascular system of the kidney, the mechanism of the circulation throughout the body.

262. A general view of the circulation, including the portal system, is given in Fig. 1, in which *a d* represents the circulation through the body, *b c* the circulation through the lungs, *e e* the exceptional portal system, and *g g* the lymphatic and lacteal system. The darker parts of the plan, on the left of the diagram, represent the venous system, and the lighter, to the right, the arterial system. The arrows indicate the direction of the stream of blood. The circulation through the heart is apparent without the use of letters.

263. *The Heart's Action.*—The *heart* is the source, and chief cause, of the circulation through the blood-vessels. The ventricles, expelling their contents with more or less frequency and force, in different per-

sons, and in the same person at different ages and at different times, send out at each contraction the blood received into the auricles from the large venous trunks.

Fig. 1.



264. The average number of contractions in a minute may be set down at 70 for an adult male, and 80 for an adult female. The quan-

tity of blood forced into the aorta at each beat of the heart in a healthy adult has been variously estimated at from two to five or six ounces; and the total quantity contained in the body at about twenty pounds (§ 190). Assuming two ounces to be expelled at each contraction, twenty pounds to be the weight of the whole mass of blood, and the pulse to beat seventy times in a minute, and further assuming the whole of the blood to be always in the current of the circulation, it is obvious that any given portion of it could not complete the circuit of the body in less than two minutes forty seconds. Müller, however, estimated the time required at from one to two minutes, and Volkmann at $34\frac{1}{2}$ seconds in an infant, and $65\frac{3}{4}$ seconds in an adult male. But Hering's experiments on the horse prove that the circulation may be completed in twenty-five or thirty seconds; while more accurate experiments of Blake's give from twelve to twenty seconds. For the dog, Mr. Blake's experiments give so short a period as nine seconds; and he showed that, in the same animal, a poison passes from the jugular vein to the lungs in four seconds; from the jugular vein to the coronary arteries of the heart in seven seconds; from the jugular vein to the carotid artery in from five to seven seconds; and from the aorta to the capillaries in four seconds. Bernard has also shown that when a solution of sulphuretted hydrogen is introduced into the jugular vein of a dog, the gas begins to be eliminated from the lungs in three seconds, and when introduced into the femoral vein in seven seconds.

The estimated quantity of the blood must, therefore, be too high, and that expelled at each beat of the heart too low; or, what is perhaps as probable, the whole of the blood is not constantly in the current of the circulation, but remains for a time in the capillary vessels, subserving the functions of secretion and reparation. The observed difference between the velocity of that part of the stream of blood which is in contact with the sides of the vessels, and of that which occupies their central axis, is also another element in the explanation of the difference between calculation and experiment.

265. The force with which the blood is expelled by the left ventricle has been estimated at somewhat more than four pounds.

266. *The Arteries.*—The blood sent out by the heart is distributed to every part of the body by the arteries. The larger arterial trunks are highly-elastic tubes, destitute of muscular fibre, admitting of expansion, both transverse and longitudinal, and able to adapt themselves to the volume of their contents. With each contraction of the heart they are expanded and slightly curved; and Poiseuille has shown that they undergo an increase of size, amounting, in the carotid artery of the horse, to $\frac{1}{23}$rd of its capacity.

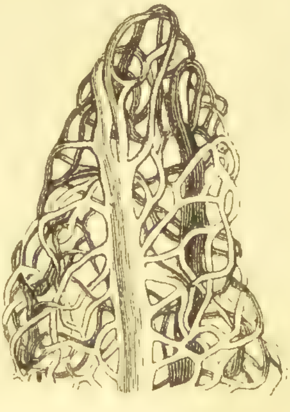
The larger arteries, by yielding to the impulse of the blood and reacting upon it, cause a delay in its motion which would not occur in rigid tubes; hence the pulse is somewhat later in the arteries remote from the heart than in those near it. This elasticity also equalizes the motion of the blood in the smaller vessels, and causes it to flow in an even stream. It also accounts for their empty state after death, their contents being forced into the veins. In old age this property is lost through degeneracy or ossification.

267. The dilatation of the arteries can only be made apparent by the use of ingenious instruments; but the large arteries may be seen to throb. This is owing to the longitudinal extension of the vessel. It is stretched and curved outwards by the forcible injection of blood; and if the finger be applied to it with a tolerably firm pressure, this effort at change of place is felt. But this is not all; for the pressure of the finger is resisted by the blood forced into the artery; and this resistance is also felt. These two things together, the change of place, and resistance to pressure, constitute the Pulse, which will be more minutely examined in the next chapter.

268. The smaller arteries which communicate directly with the small veins, or from which the capillaries spring, have two muscular coats, the inner longitudinal, the outer circular. In cases of obstructed capillary circulation these muscular fibres have been found hypertrophied; and there is reason to believe that this condition, first demonstrated by Dr. George Johnson in the case of the minute arteries of the kidney, extends to the small arteries of every organ of the body, and plays an important part in regulating the local supplies of blood. The arteries intermediate between the large trunks and their smaller branches, have more or less muscular fibre as they approach to the one or the other class of vessels.

269. *The capillaries* are vessels of extreme minuteness, consisting ot a single membranous coat, through which the portion of the blood destined for secretion or nutrition finds its way. They form a network, between the meshes of which the proper substance of each organ lies, or they are so disposed as to adapt themselves to the form and arrangement of the several tissues; and they establish a communication between the last divisions of the arteries, and the first of the veins. The small arteries which do not lose themselves in veins have no other termination, and the veins no other origin; and there are no vessels terminating by open mouths. This continuity of the arterial and venous system through the intervention of the capillaries is shown in the annexed engraving of the villi of the small intestine (Fig. 2), in which the shaded vessels represent the veins, and those in outline the arteries.

Fig. 2.



270. The motion of the blood in the capillaries is mainly due to the heart's action; its constant and equable flow to the elasticity of the arterial trunks; and some modifications, at present little understood,

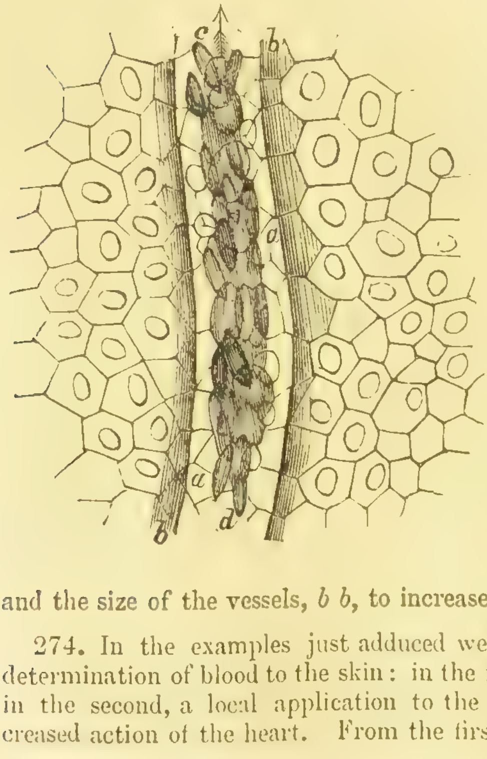
to the muscular contractions of the smaller arteries, and to the processes of secretion and nutrition going on in the parts to which the vessels are distributed. The motion of the blood is slow in the capillaries, owing to the resistance offered by the coats—a resistance calculated at from two-thirds to three-fifths of the force of the heart.

271. In health, the capillaries subserve the important function of nutrition by allowing the ready exsudation through their thin membranous wall of the materials which the several tissues require for their growth and repair; and in disease they play an important part in the changes known as *inflammation, irritation, and congestion.*

272. The minute arteries and capillary vessels are subject to changes in health, which enable us to understand disease. Shame brings a blush to the cheek; fear blanches it. Warmth and exercise redden the skin; cold and continued rest deprive it of colour. Now, the blush of shame, the redness caused by heat, the glow of exercise, and the pallor produced by fear, by cold, or by continued rest, depend on changes in the circulation through the small arteries and capillary vessels.

273. There are three distinct ways in which redness of the surface, due to changes in the small vessels, may be brought about:—the circulation may be quickened, so that more red particles traverse the vessels in the same time; or that portion of the calibre of the vessels which is nearest to their coats, and which in tranquil states of circulation transmits a colourless fluid, may admit the red particles; or the size of the vessels may be increased. These statements are fully borne out by microscopic examination of the circulation in the frog's foot (Fig. 3).

Fig. 3.



The velocity of the circulation is seen to increase, the outer portion, *a a*, of the calibre of the vessels to admit red particles, *c d*, and the size of the vessels, *b b*, to increase or decrease.

274. In the examples just adduced we have three distinct causes of determination of blood to the skin: in the first an emotion of the mind; in the second, a local application to the vessels; in the third, the increased action of the heart. From the first example it appears that the

state of the small vessels may be changed without increased action of the heart, for if the enlargement were due to that cause, the blush would not be confined to the cheek; from the second, that local applications will affect them in the same way; and from the third, that the same result may follow from the stronger and more frequent contraction of the heart itself. The cases in which pallor of the skin occurs are equally instructive, proving as they do the local effect of emotion in contracting the small vessels, the equally local effect of cold, and the remote effect of a quiet action of the heart.

275. In the effects of emotion and of stimulating local applications we have examples of the small vessels dilating without any force from behind, and in the act of blushing, proof of a relaxation of the muscular coats of the small arteries, due to a nervous influence.

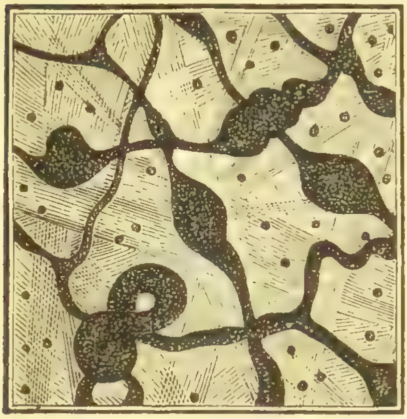
276. As the capillaries consist of a single membranous coat, without muscular fibres, it is probable that they are passive in the local changes that occur in the circulation of the blood, and that the rate of the circulation through them is determined by the state of the small arteries on the one hand, and the greater or less vigour of the processes of secretion and nutrition on the other.

277. It appears, then, that, in one instance at least, the enlargement of the minute arteries is only to be accounted for by a diminution or suspension of their contractility. Now, this same enlargement of the small arteries occurs in inflammation. Is it due to the same cause? A grain of sand gets into the eye, and in a short time the vessels of the conjunctiva become filled with red blood, and enlarged, obviously without any increased action of the heart, for the other eye, equally affected by the general circulation, is not inflamed. Again, the immediate effect of ice applied to the finger is to contract the vessels; but no sooner is it removed, than the pale skin resumes its colour and becomes even redder than the surrounding skin. This change, too, is strictly local, and independent of the heart's action. The same contraction of the small arteries, followed after a variable interval by dilatation, has been shown, by experiments under the microscope, to follow the application of mechanical and chemical irritants. So that it may be stated as a general fact, that the agents which excite inflammation first cause contraction of the small vessels; and that this contraction is followed by dilatation.

278. These actions take place in obedience to a general law, that stimuli applied to any part of the body, acting through its nerves, develope the special functions of that part for a time, but that the nervous force suffers an exhaustion proportionate to its intensity and duration, and brings about a condition the very reverse of that which existed when the stimuli were first applied. In the case now under consideration the stimulus first developes the proper function of the small arteries (their contractility), exhaustion ensues, that function is paralysed, the vessels expand, and yield to the impulse of the blood.

279. During this first period of contraction the flow of the blood is retarded; but when the vessels become dilated, the circulation is accelerated, to be again retarded after an interval of time. The small vessels, in becoming dilated, are also stretched and twisted, and here and there even become varicose, as is shown in the annexed engraving from Valentin, after Harting (Fig. 4). In consequence of this increase of size, the vessels admit a larger number of red particles; and those that previously conveyed only colourless blood, now become carriers of red blood.

Fig. 4.



280. The changes that occur in an inflamed part are not long confined to the small vessels. The larger arteries and veins suffer the same dilatation; and if the inflammation prove severe and extensive, the arterial trunks themselves participate; and thus large portions of the body —a hand, a foot, a limb, or an internal organ—become so many congeries of enlarged vessels containing more blood than those of the corresponding part of the body. An inflamed hand, for instance, contains much more blood than the sound one; its radial artery is evidently enlarged, through loss of contractility and increased action of the heart; and if a vein of that side be opened, it will pour forth much more blood than the vein of the opposite side.

281. Through the increased action of the heart, which occurs in all acute inflammations, blood is sent in greater quantity to every part of the frame, and gives rise to *symptomatic fever*, converted, if the nervous system suffer much, to the state known as *irritation*, *constitutional irritation*, or *irritative fever*; if the patient has been intemperate, the loss of his accustomed stimulus, and the increased flow of blood to the brain, may give rise to *delirium tremens*; and, should the power of the constitution have been previously exhausted, the fever may assume the *typhous* type in place of the milder form it assumes in the strong and robust.

282. It appears, then, that in acute inflammation both the heart and the small arteries are ultimately involved, the one sending forth more blood, the other receiving more. The *heart's action*, which is *muscular contraction*, is increased; the *action of the small arteries*, which is also muscular contraction, is diminished. So that there is no such thing as the increased action of the arteries, in the sense in which that term was formerly used: that which was called *increased* action. is, in fact, *diminished* action.

283. This account of the state of the vascular system, and of the

circulation generally, in inflammation, though sufficient for practical purposes, must not be taken to be a complete *theory of inflammation.* We have yet to take into account the organic tissues, to the functions of which the whole vascular system is subservient—the arteries and veins as carriers of the blood to and from them, and the capillaries as the intermediate connecting tubes through the membranous walls of which the tissues attract the materials of their growth and repair, and the fluid solvent of such portions of them as have served their purpose in the economy, and become effete.

284. The secreting cells, which constitute the bulk of these tissues, play an important part in the production of inflammation. When it originates in increased action of the heart, the function of secretion in the cells is deranged by the turgescence of the vessels. The increased quantity of blood imposes on them more work than they are able to perform. Hence, the elements of the secretion accumulate in the blood, while the turgescence of the vessels is increased and perpetuated. On the other hand, when the first link in the chain of causes is an accumulation in the blood of the elements of an important secretion, say of the bile or urine, or the introduction of a poison, such as antimony, arsenic, or mercury, the second link is the rapid destruction of the secreting cells, the third, the arrest of the circulation in the capillaries, and the last link of the local chain, the dilatation of the small arteries. An increased action of the heart is all that is needed to complete the idea of inflammation as it commonly presents itself.

285. An excellent illustration of the share the secreting cells have in bringing about these phenomena is afforded by inflammation of the kidney. The first link in the chain of causes is a rapid desquamation of the epithelial cells lining the urinary tubes; the detached cells clog the tubes; the blood in the capillaries is arrested, and blood or serum is extravasated from the Malpighian tufts.

286. The processes of nutrition and inflammation are, in fact, strictly analogous. In healthy nutrition the cells of the tissues attract from the blood, through the walls of the capillaries, the materials of growth and repair; while the liquor sanguinis, from which these materials have been abstracted, having dissolved the *débris* of the effete textures, is restored to the circulation by the absorbents and veins. In adults, under ordinary circumstances, the formation of new exactly counterbalances the destruction of old tissue; but during the period of growth, and in certain parts of the system, as the womb and breasts, to meet an occasional demand, nutrition is more active than the work of destruction. The same thing happens in some subacute inflammations which terminate in hypertrophy. In healthy inflammation, too, the increased attraction of the tissues draws from the capillaries liquor sanguinis, or coagulable lymph rich in fibrine, and capable of developing cells by which the destructive effects of inflammation are repaired, or the tissues increase in bulk and firmness.

287. The enlargement of the small vessels in inflammation, then, is

quickly followed by effusion. When the skin is inflamed, as by a burn, serum is thrown out from the surface under the cuticle, and a blister rises: when a mucous or serous membrane is inflamed, fluid exsudes from its surface: when the cellular membrane is attacked, the fluid is poured into its cells. This effusion varies with the constitution and state of system, the condition of the part, and the intensity and nature of the inflammation; and may present every variety between a lymph abounding in fibrine, and a lymph rich in granules or corpuscles.

288. The lowest degree of inflammation merely increases the natural secretion of the part attacked—of serum, in the case of serous membrane—of mucus, when a mucous surface is inflamed. A higher degree of inflammation causes the effusion of coagulable lymph (the fibrine of the liquor sanguinis) or of pus. The increased natural secretion of the serous membranes is *dropsy*, or, when of limited extent, *œdema*; that of the mucous membranes, *flux*. Both these membranes, also, when the inflammation is more intense, pour out fibrine or pus. It is in this way that the inflamed surfaces of the pleura or peritoneum become glued together, and the effused matter, becoming organized, forms permanent adhesions. The mucous membranes, too, when highly inflamed, pour out coagulable lymph of such tenacity as to assume the shape of the tubes which they line, and even to be mistaken for the detached lining membrane itself. This occurs in the larynx, in diptheria and croup; in the bronchial tubes, in a peculiar form of bronchitis; in the intestines, in dysentery; in the kidneys, in inflammatory affections of those organs. Of purulent secretion from serous membranes, empyema is an example; and of the formation of pus by mucous surfaces, purulent ophthalmia.

289. When the small vessels return to their natural size, and any fluid that may have been poured into the surrounding textures is absorbed, the inflammation is said to terminate by *resolution*; when blood is thrown out, by *hæmorrhage*; when serum, by *effusion*; when fibrine or coagulable lymph is formed and organized, by *adhesion*; when pus is effused, by *suppuration*; when the part dies, by *gangrene*. Inflammation of mucous surfaces, or of exposed portions of cellular membrane, accompanied by the effusion of pus, and the more or less rapid removal of the part affected, constitutes *ulceration*; and a similar process in the substance of organs is known as *ramollissement*, or softening.

290. The generic term inflammation is often qualified by other words indicative of its character. Thus we have *œdematous* inflammation, or inflammation terminating in, or accompanied by, *œdema*; *adhesive*, or inflammation terminating in *adhesion*; *suppurative*, or inflammation issuing in *suppuration*; *gangrenous*, or inflammation ending in *gangrene*. The terms *acute*, and *chronic*, *healthy* and *unhealthy*, *common* and *specific*, *phlegmonous* and *erysipelatous*, are also used to designate varieties of inflammation.

291. When inflammation attacks the cellular membrane, whether in

the skin or in the substance of internal organs, it takes different courses according to its intensity. If slight, it terminates in *resolution;* if more severe, *effusion* may take place; if more severe still, *suppuration;* if still more intense, *gangrene.* If a portion of the cellular membrane die, or if blood, serum, or fibrine is poured out so abundantly as to distend and break down the tissue, pus is thrown out in small detached portions, which, by solution of the intervening parts, coalesce, so as to form one single collection of purulent matter, round which a wall of fibrine or coagulable lymph is built up, becomes organized, and constitutes a *cyst* or *sac.* This collection of pus in a cavity, bounded by a wall of effused and organized fibrine, is called an *abscess*—a term which, like the word inflammation, is qualified in practice by phrases indicative of its character or progress, such as the *acute* or *phlegmonous,* and the *chronic* abscess.

292. Sometimes the constitution is not strong enough to build up and organize a wall of fibrine about the dead part, and then the pus finds its way into the surrounding cellular texture, and forms a *diffused abscess,* or the inflammation is peculiar, as in erysipelas, and suppuration takes place with little or no adhesion.

293. In rare instances the pus which had been thrown out is absorbed, and the abscess is said to be *dispersed;* but in the majority of cases fresh pus is formed, the abscess increases in size, and presses on surrounding parts, some of which yield to the pressure, and then the abscess is said to *point;* and if it is near the surface, the skin itself offers least resistance, is protruded, and stretched more and more, till it bursts.

294. When the matter of an abscess is discharged, the cavity contracts, the fibrinous lining is cast off, and the walls become a suppurating surface, on which fresh fibrine is effused. Part of this fibrine becomes organized by vessels, which either form within it, and then connect themselves with those of surrounding parts, or gradually extend into it from those parts. These newly-organized portions of fibrine are arranged side by side as small rounded vascular points, called *granulations.* The fresh surface thus created secretes pus, which protects it from the air. When the granulations approach the surface, the pus hardens into a *scab,* which forms a still more efficient protection. In healthy persons the granulations are numerous, small, and florid, and coated with a creamy pus, known to the older surgical writers as *laudable* pus. Unhealthy granulations, on the other hand, are large, pale, and flabby, and discharge a thin flaky pus. The various appearances presented by the granulations, and the changes they undergo with alterations in the general health, form a subject of interesting and instructive study.

295. When the tissues are divided, and the two edges of the wound thus formed are brought close together, and kept in contact, a speedy and perfect union may take place, and the wound is then said to have been healed by the *first intention.* But the part may not heal

in this simple way: the wound may gape, and an open sore or *ulcer* be formed, presenting the same granulations as the walls of an abscess that has burst. These, once completely organized, secrete fresh coagulable lymph, and this, in its turn, is moulded into new granulations; and thus the ulcer is at length filled up to a level with the surrounding skin, and protected by a scab; a small portion of new tissue is meanwhile formed between the edges of the wound which gradually contract as the surface heals. Ultimately the scab falls off and exposes the new-formed tissue. The *scar*, or *cicatrix*, is at first red, but the colour gradually fades, and at length the scar is recognised by its whiteness.

296. As a general rule, abscesses, whether in the integuments or in the solid viscera of the body, tend towards the surface; but to this rule there are exceptions. If, for instance, an abscess form in such an organ as the liver, its firm close structure may offer more resistance than the loose texture of an adjoining intestine: the abscess presses upon its coats, and adhesive inflammation is set up between the two layers of serous membrane; the peritoneum and the coats of the intestine are thus so glued together as to form one continuous texture through which the abscess, continually increasing, forces its way, till it bursts and discharges its contents. Sometimes the course of an abscess is more circuitous, as when an abscess of the liver finds its way through the diaphragm, and opens into the air-passages of the lungs. Sometimes, again, an abscess in a solid viscus discharges itself into the serous cavity which surrounds it. Abscess of the lung, opening into the sac of the pleura, is an example in point.

297. As a general rule, the matter of an abscess takes the shortest course to its place of discharge; the most common exception being in the case of collections of matter formed beneath fasciæ, by which they are bound down and diffused.

298. *Ulceration* is very analogous to suppuration.' Ulceration of the skin, for instance, begins with inflammation, and is followed by the effusion of serum or pus, known as a vesicle or pustule. This breaks, and leaves an uneven surface, covered with flakes of lymph, and moistened with pus, which may either heal in the way just described, or extend and enlarge by the destruction of the skin and subjacent textures. In ordinary cases the parts are removed gradually, and almost imperceptibly; in others, with great rapidity, when the ulcer is called *phagedenic;* in others, again, the inflammation is so intense as to cause the death of considerable portions of the cellular membrane, in which case it is called a *sloughing* ulcer. The most rapid destruction of parts with which we are acquainted has received the name of *sloughing phagedena*, or *hospital gangrene*. Ulcers are further designated as *acute* and *chronic; healthy* and *unhealthy*, *inflamed*, *indolent*, and *irritable; congestive*, *varicose*, *fistulous*, *rodent*, &c.

299. *Gangrene* is one of the terminations of inflammation; and the death of a limited portion of the cellular or other texture is an occa-

sional cause of abscess. The common *boil* is an example of a more extended death of the cellular tissue, and *carbuncle* of the worst form of boil. But gangrene may take place without the formation of an abscess. It may attack a limb, in consequence of the extreme languor of its circulation, and, beginning in the foot, extend upwards till it reaches a part where the circulation is active enough to allow of adhesive inflammation. Coagulable lymph is thrown out in a circle, dividing the sound from the dead parts; granulations are formed, pus effused, and at length natural amputation of the dead member will be effected. Thus, through the different effects produced, and the different secretions poured out, in different degrees of inflammation, the body sets limits to its own diseases, and repairs the most severe injuries.

300. Sometimes gangrene takes place without inflammation, as in a limb of which the arteries are ossified, or in cases of poisoning with ergot of rye: this is distinguished as *dry* gangrene. When gangrene, from extreme languor of the circulation in the lower extremeties, attacks aged persons, it is known as *senile* gangrene.

301. The most common constitutional or predisposing cause of gangrene is debility; the most common exciting causes are severe mechanical injury, the action of violent irritants, pressure, and intense cold. The immediate or proximate causes are a deficient supply of arterial blood, impediments to the return of the venous blood, and injury or division of the nerves. The term *mortification* is commonly used as synonymous with gangrene; and the word *sphacelus*, or *slough*, is generally employed to characterise a part not susceptible of being restored to life.

302. A complete description of inflammation, its causes, its phenomena, its terminations, and the various modifications it undergoes in different states of health, in different constitutions, and in each texture of the body, would exceed the limits of this work; but there is one important species of inflammation known as *erysipelatous*, which must not be passed over.

303. *Erysipelatous inflammation* is characterised by spreading over the skin or over the surface of membranes, by attacking different parts of the body, either simultaneously or by *metastasis*, by its contagious and infectious character, and by the lymph which is poured out being incapable of organisation. In its milder forms, as when it attacks the face, the disease scarcely extends beyond the skin itself, and is then called *simple* or *cutaneous;* but in its more severe forms the cellular membrane is implicated, and the disease is known as *phlegmonous* erysipelas.

304. Closely allied to erysipelas of the skin is that inflammation of the peritoneum which occurs in puerperal fever, associated with acute inflammation of the veins of the uterus and of other parts of the body, and followed by purulent deposits in the joints, and in the liver, lungs, and other viscera. The coexistence of erysipelas on the skin with puer-

peral fever, of erysipelas on the infant and puerperal fever in the mother, and the occurrence of diffuse erysipelatous inflammation as the consequence of wounds received during the examination of the bodies of women who have died of the fever, fully establish this connection.

305. *Congestion* is nearly allied to inflammation. It consists in a passive enlargement of the small vessels, without inflammatory symptoms or other effusion than that which consists in an increase of the natural secretion of the part. This enlargement of the vessels is the effect of debility, and, as such, is apt to continue in parts in which the symptoms of acute inflammation have been subdued. It is common in the aged, and in persons exhausted by suffering. From its involving the veins rather than the arteries, it is often termed *venous congestion.* Pressure is a common cause of this state: hence congestion of the veins of the leg after long standing, of the vessels of the head from wearing a tight cravat, and in the lungs from hindrances to the respiration.

306. *Congestion of internal organs* is a common occurrence, and plays an important part in the development of organic disease, and in the hæmorrhage and dropsy which so frequently accompany it. Some of the causes of visceral congestion, such as cold applied to the surface. a continued dry state of the skin in febrile disorders, and the plethora induced by a rich and stimulating diet, combined with insufficient exercise, are very simple and obvious. The continued action of these causes leads sooner or later to organic disease in some predisposed organ, such as the brain, the lungs, the liver, or the kidney. Hypertrophy of the left ventricle of the heart also gives rise first to congestion, and then to organic disease of all the internal organs.

307. But besides this general internal congestion, leading to organic disease of some one of the congested organs, there are instances of congestion commencing in a single organ, and forming the first link in a chain of very interesting and instructive pathological changes, analogous to those already described as belonging to inflammation, §§ 268 and 284.

308. If we take the kidney as an example, the primary source of the congestion would seem to be, in all cases, either an impure condition of the blood (the impurity consisting in the excess of some element which should be eliminated by the kidney), or a process of desquamation strictly analogous to that of the skin in scarlatina. In either case, the first morbid change consists in desquamation, or separation of the secreting cells, which are rapidly thrown off in large numbers, so that the tubes become clogged, and further secretion impeded; or the tubes become altogether denuded of their cells. This leads to congestion of the intertubular capillary vessels, extending backwards to the Malpighian capillaries, which, according to the degree of congestion, pour out blood or serum, or first blood, then serum. The blood thus poured out is partly discharged with the urine, and partly separated into its constituent parts, the fibrine, and part of the colouring matter, coagulating in the tubes, and being voided in the form of cylindrical moulds. In

simple desquamation, these moulds have epithelium-scales adhering to their external surface, without oil globules: but in more severe forms of disease, especially where the secreting tubes are denuded of their cells, oil globules are found blended with the scales. The local congestion thus set up, if extensive or of long continuance, constitutes an obstacle to the movement of the blood, which ultimately affects the centre of the circulation, and leads first to over-action, and then to hypertrophy, of the left ventricle. After a time, this state of hypertrophy causes congestion of other internal organs, with the hæmorrhages and the serous effusions that follow hypertrophy of the heart due primarily to other causes. (Dr. George Johnson.)

309. Similar changes occur in asphyxia, as was shown by Dr. John Reid. The carbonic acid accumulating in too large a quantity to be eliminated by the secreting apparatus of the lungs, the capillary vessels become turgid, and death supervenes before inflammation has time to develope itself.

310. *Hæmorrhage* is a common consequence of congestion, when it is termed *passive;* but it sometimes appears to flow immediately from the arteries, when it is termed *active.* Hæmorrhage from the lungs is generally caused by rupture of an artery; but in hæmorrhage from the stomach and bowels, the blood seems to exsude through the coats of the vessels. Hæmorrhage may also take place into the ducts of secreting organs, such as the liver or kidney. In scurvy and in putrid fevers the hæmorrhage is due partly to weakness of the vessels, and partly to thinness of the blood. Hæmatemesis, melæna, and hæmorrhoids, are examples of passive hæmorrhage. The copious discharge of red blood from the bowels, traceable by the use of the speculum ani to a small spot in the mucous membrane of the intestine, is a good example of the active form.

311. *Nutrition* and *secretion.*—These two processes are essentially the same; for they consist in the development of simple cells endowed with independent vitality, and capable of assimilating from the blood their own peculiar fluids.

312. The *secreting organs* assume various forms: but consist essentially of a basement membrane coated with epithelial cells, and covered externally with a network of blood-vessels.

313. In *nutrition* each cell runs through its course of gradual development and decay, and the products of its decomposition (the first in order being, as in all forms of decay, carbonic acid), are absorbed into the blood, and discharged by appropriate excreting organs.

314. In *secretion*, too, the cells which form the essential secreting organ ripen by the absorption of materials constituting the secretion, and then break up and decay; the mixed products being poured into tubes fitted for their reception and discharge.

315. The fluids thus poured out by the secreting organs are known

as *excrementitious* and *recrementitious*; that is to say, they are expelled as hurtful, or retained to serve some useful purpose.

316. To the class of *excrementitious* matters belong the urine, the sweat, the water and carbonic acid exhaled from the lungs, a small portion of the bile, the secretions of the several mucous membranes of the body, the menstrual discharge, and the hair, cuticle, and nails. Milk and semen, the one nutritive, the other reproductive, form a class by themselves.

317. Of the *recrementitious* secretions some (as those of the salivary glands, stomach, liver, and pancreas) subserve the process of digestion; others (as the tears, and the watery secretion of the Malpighian tufts of the kidney) cleanse the surface of the eye and the urinary tubes respectively; others again (as the sebaceous secretions of the skin, the mucus of the mucous membranes, and the aqueous secretion of the serous membranes) protect the parts which they moisten from injury, and facilitate their movements.

318. Another secretion not destined to immediate expulsion from the body consists of the fat deposited in cells of the adipose tissue, giving roundness to the form, facilitating motion, protecting the external parts from cold, and serving as a store of nourishment.

319. Of secreting organs in the membranous form the serous membranes (the pleura, peritonæum, arachnoid, and the synovial membranes of joints) are examples, as well as the mucous membranes (that lining the mouth and nostrils, the windpipe and lungs, the alimentary canal and the parts communicating with it, and that lining the urinary passages and organs of generation). The skin is a compound organ, containing a variety of secreting glands.

320. *Glands*, in the usual acceptation of the term, are of three kinds —1, collections of blood vessels, as the spleen and placenta; 2, similar congeries of lymphatic vessels (lymphatic glands); and 3, true secreting organs. These latter are of two kinds, the one secreting into cells a fluid to be again removed by absorption (*e. g.*, the thymus and thyroid glands), the other furnished with ducts for the discharge of fluids, which either subserve other purposes in the economy, or are thrown off as useless. These organs all consist of an excretory duct, which, if we trace it backwards from its trunk, divides into branches, and these again into others of smaller size, until the smallest terminate in blind extremities of various shapes, called cells, follicles, acini, &c. On the outside of these minute terminations, the capillary blood-vessels ramify, and the appropriate secretion permeating their invisible pores, drops into the cell, follicle, or acinus, and thence flows into the duct. The unused blood is returned by appropriate veins.

321. In the kidney, the secreting apparatus is more complicated, consisting of a tuft of vessels (the Malpighian body), which secrete water, and tubes lined with epithelium, which eliminate the solid constituents of the urine. The water serves to wash out these solid matters—an

operation assisted, in reptiles and fishes, and probably in mammalia also, by the cilia which line a portion of the tubes.

322. Secretion, like nutrition, is subject to differences in degree and in kind. The natural secretion of a part is augmented by increased flow of blood, provided it be not excessive. Thus perspiration follows exercise, and diarrhœa ensues on slight inflammation of the mucous membrane of the bowels. Secretion may also be increased by debility of the small vessels, when the circulation is languid, as in the cold sweats following a faint, or preceding dissolution. These two causes of increased secretion—augmented flow of blood, and weakness of the vessels—combine to produce the night sweats of hectic fever. On the other hand, the natural secretion of a part is diminished when the supply of blood is either lessened or augmented, as is the case with the skin both in the cold and in the hot stage of fever. In this latter case, as soon as the fever subsides, and the quantity of blood sent to the skin falls to a certain point, sweating begins. The nerves, too, have great effect on the secretions, as is seen in the flow of tears from grief, joy, or rage, and in the effects of fear or anxiety on the skin, kidneys, and bowels. Mental emotion, however, checks some secretions. Thus fear, which increases the secretion of the skin, checks that of the salivary glands.

323. But the secretions vary in *kind* as well as in degree; in other words, they are liable to morbid changes. Thus, the serous membranes, which in health secrete a watery mist or vapour, under a certain degree of inflammation pour out serum, and dropsy results; under a higher degree liquor sanguinis is poured out; under a different and perhaps higher degree, pus. The mucous membranes, according to the degree of inflammation, secrete a glairy fluid, tough mucus, pus, or fibrine, or all these secretions blended in different proportions, as may be observed in the course of a severe attack of catarrh.

324. Serious consequences result from the suppression of secretions, or from the non-elimination of some of their important constituents. Jaundice is an example of the suppression of an entire secretion. The non-elimination of *urea*, or of its combinations, by the kidneys, is an example of the suppression of an important constituent, followed in slight cases by erythematous swellings and boils; in more severe ones, by gout and rheumatism; in extreme cases, by fatal coma.

325. What has been said of the similarity of structure in the several secreting organs will prepare us to view, without much surprise, the assumption by one secreting organ of the functions belonging to another. This is termed the *metastasis* of secretions. Familiar examples of this phenomena are, the secretion of urine, or of a fluid nearly resembling it, by the skin and several of the mucous surfaces; of bile, by almost all the secreting organs, as in jaundice; of milk, by the skin and lungs; and of the menstrual flux, by the vessels of the nose, lungs, and stomach, and from the surface of ulcers.

326. *The Veins.*—The veins are larger than the arteries, and have no

elastic coat. The larger veins of the extremities also differ from the arteries in being provided with valves to prevent regurgitation, and give support to the blood which they contain.

327. The venous circulation is effected mainly by the impulse of the heart continued through the capillaries; but it is assisted by the contraction of the muscles of the extremities pressing the blood towards the heart. The movement of blood in the great veins near the heart is further accelerated by the act of inspiration, and partly, as some suppose, by the suction of the heart itself.

328. At each inspiration the chest is enlarged by the descent of the diaphragm, and the elevation and tilting outwards of the ribs. This tends to produce a vacuum, which is prevented by the entrance of air, of blood, or of both. That the motion of the blood in the large veins is thus accelerated is shown by experiments, and by the phenomena attending the admission of air into wounds in the larger venous trunks. It has also been shown experimentally that at each systole of the heart a tendency to a vacuum exists in the pericardium, counteracted by the blood of the large veins distending the auricles.

329. The assistance given to the venous circulation by inspiration is somewhat counteracted during expiration, when the pressure on the contents of the chest causes regurgitation of blood into the larger veins. As, however, the effect of inspiration is greater than that of expiration, there is a balance in favour of the circulation.

330. When the right auriculo-ventricular valve allows of regurgitation, the blood flows back into the descending cava and jugular vein, causing a *venous pulse.*

331. Poisonous substances introduced into wounds soon find their way into the veins. This proves either that the veins themselves absorb, or that the capillaries which terminate in them possess this power. It is through this absorption into the circulation that poisons act; hence the efficacy of ligatures applied above wounds, of the abstraction of the blood below the ligature, and of the application of cupping-glasses, which answer the double purpose of ligatures and evacuators.

332. *Absorption.*—This term is applied to the act of taking up into the circulation both fluid and solid matters, the latter being distinguished as instertitial absorption. The capillaries and veins both act as absorbents; but the lacteals and the absorbents, properly so called, are also provided, the one for the removal of the chyle from the intestines, the other for the removal of lymph from every part of the body.

333. Absorption is certainly effected in more ways and by more means than one. Living and dead tissues allow the passage of fluid and gaseous matters through them. This is called *imbibition.* If two gases are in contact with the moist surfaces of a bladder, one within

and the other without, both will permeate the bladder till they are equally mixed. A gas, likewise, will pass through a moist bladder to mix with a fluid within it. This takes place in the lungs. Again, if a vessel be filled with water, and a moist bladder be tied over its mouth, so that the fluid is in contact with the bladder, and a salt be strewed over its surface, it will be dissolved by the water which permeates its pores. If a tube filled with a solution of salt or sugar, and closed by a bladder, be placed in water, the water permeates the bladder, mixes with the solution, and rises in the tube. At the same time part of the fluid contained in the tube traverses the bladder in an opposite direction, and this interchange takes place till the fluids on both sides have become homogeneous. If the arrangement be reversed, so that the denser liquid is outside the bladder, and the rarer liquid in the tube, the liquid in the tube passes through the bladder, and gradually sinks to a lower level. These phenomena constitute the "endosmose" and "exosmose" of Dutrochet. Lastly, if a vessel made of vegetable parchment, or other permeable material, filled with a liquid consisting of animal, vegetable, or mixed matters holding some salt or metallic oxide in solution, be floated on the surface of distilled water, the salt or metallic oxide will traverse the membrane and lose itself in the water, the thick, gummy matters remaining behind. To this process, devised by Graham, the term *dialysis* has been applied. These processes of *imbibition*, *endosmose* and *exosmose*, and *dialysis*, are believed to bear their parts in the work of absorption.

334. Matters in solution pass into the capillaries, and thence into the veins by the process of "endosmose," which goes on the more rapidly as the denser fluid (the blood) is no sooner diluted than it gives place to a fresh portion, and thus endosmose takes place more completely, and goes on more constantly, than in fluids at rest.

335. This process of absorption is very rapid. In a part free from epidermis it is almost instantaneous; and minute portions of fluid, or of substances held in solution, may be absorbed, and distributed through the body in from less than half a minute to two minutes. In this way the rapid action of the more energetic poisons is explained; and it is only in rare instances, if in any, that a different explanation is needed.

336. The rapidity with which absorption takes place is shown by the passage of certain salts from the stomach to the kidney. In one experiment made by Westrumb, prussiate of potash was detected in the urine after two minutes; and in the history appended to a cast of the Epispadian Arburg, in the museum of King's College, it is stated that fluids may be seen trickling from the ureters into the bladder in from two to three minutes after they have been swallowed.

337. Several agents affect the rapidity with which imbibition and absorption take place. Of these galvanism is the chief. Thus Foderé showed that when a solution of sulphate of iron is poured into the peritonæum, and one of prussiate of potash into the pleura, five or six minutes usually elapse before the two combine, but that this happens

instantaneously when a slight galvanic current is passed through the diaphragm. Absorption is also promoted by friction. Again, distension of the vessels retards absorption, while depletion accelerates it. Hence the use of venæsection in dropsy. Absorption also takes place slowly in parts covered by dense membrane. Hence the absorbing power of the skin is much increased by removing the cuticle. Absorption takes place readily from the subcutaneous cellular tissue.

338. All these means of promoting absorption are used in the practice of medicine—*galvanism*, especially in the case of effusions into joints; *depletion* in dropsies of the skin and serous cavities; *abrasion* by blisters, followed by narcotic applications, in severe neuralgia; *friction* of the surface with nutritious fluids in cases of extreme emaciation, and *subcutaneous injection* of narcotic solutions to relieve pain.

339. The absorption of fluids less dense than the blood is easily accounted for by endosmose, which probably takes place chiefly through the coats of the capillaries or veins; and it is by this means, as just stated, that poisons find their way into the system. But the absorbent vessels also take up and restore to the circulation the serum which has exsuded through the parietes of the capillaries, being the liquor sanguinis, *minus* the fibrine and corpuscles, that has been used to build up the solid textures of the body. By the absorbents, too, it is most probable that interstitial absorption is brought about.

340. Of disordered functions of the absorbent vessels little is known. Formerly all dropsies were attributed to inaction of the absorbents, and such remedies were given as were thought to stimulate those vessels. It was obviously reasonable to suppose, that the functions of the absorbents, like those of other vessels, vary in activity at different times and under different circumstances; but as the veins have been proved to possess the power of absorption as well as the lymphatics, it is difficult to assign to each class of vessels its proper sphere of activity, whether in health or disease. It has been shown, for instance, by direct experiment, that the veins absorb poisons; but it is no less clearly demonstrated by disease, that some poisons excite inflammation in the entire course of the absorbent vessels, and in the glands through which they pass; and this is attributed, and probably with justice, to the absorption of the poison by those vessels.

341. But whatever the share taken in the work of absorption by the veins and absorbents respectively, there is no doubt that the part played by the absorbents in the production of dropsies has been much exaggerated. These arise in various states of systems, and from various causes. Mechanical obstruction, venous congestion, inflammation, or debility, may give rise to an effusion of serum too abundant to be removed by the unaided, though still healthy, action of the absorbent vessels. If the obstruction be overcome, or venous congestion removed, or inflammation subdued, or the strength restored, the effusion ceases, and time alone is required to enable the absorbent vessels, whether veins or lymphatics, to take up the fluid which has been poured out.

342. The doctrine that dropsies are generally due to inaction of the absorbents is in opposition to the notorious facts that patients suffering from dropsy are very readily affected by preparations of mercury, which must be absorbed before they can act, and that their adipose tissue is often rapidly removed, so as to occasion great emaciation.

343. The known efficacy of venous distension in preventing absorption, and of depletion in promoting it, point at once to the most efficacious means of removing dropsical effusions, viz., bloodletting, and the increase of the several secretions. If there is sufficient strength of constitution, these means suffice for their removal ; if not, tonics or stimulants have to be combined with the antiphlogistic measures.

344. The removal of solid diseased structures has also been attributed to the increased action of the absorbents, but perhaps without sufficient reason. Pressure, friction, and electricity, as well as mercury and iodine, are as likely to affect the small vessels which cause the morbid growth, as the lymphatics or veins, which are instrumental in removing it—moderate pressure, by giving support to the vessels ; stronger pressure, by still further diminishing their size ; friction and electricity, by stimulating their coats and restoring their contractility ; and iodine and mercury, by a local action on those vessels, whether through the skin, or more circuitously through the circulation. The cessation or gradual removal of tumours by these agents is more satisfactorily explained in this way than by an action upon the absorbents.

345. In the case both of dropsies and tumours, the result would be the same, whether the small vessels, ceasing to secrete fresh fluids or solids, the absorbents, without increase of activity, remove by degrees that which has been effused ; or the vessels, continuing to secrete, the absorbents are excited to a corresponding increase of activity. The only difference is that, according to the first supposition, the cause is removed ; according to the second, the effect is counteracted. The first supposition seems the more feasible.

346. The physiology and general pathology of the circulating system would be incomplete if reference were not made to the peculiarities that mark the circulation through the *liver* and through the *brain*.

347. The function of the liver, and the nature of its secretion, have already been considered at some length in § 170 *et seq.* and § 243. The peculiarities of its circulation have yet to be described. The liver differs from the kidneys in being supplied for the purpose of secretion with venous instead of arterial blood. It is true that the solid constituents of the urine are also secreted from blood which has previously been submitted to the action of the Malpighian tufts ; so that a circulation analogous to that of the portal system of the liver exists within the kidney. But in the liver (and this is true also of the lungs) the secretions are immediately derived from the venous blood. The vena portæ is formed by the union of the veins of the stomach and intestines,

of the spleen, pancreas, and gall-bladder, of the mesentery and omentum. With a slight and unimportant exception, it gathers the venous blood of the entire intestinal canal and of all the organs engaged in the work of digestion, conveys it to the liver, where the bile is secreted from it, and is poured into the duodenum to aid in the digestion of the food, and to subserve the function of respiration. The position of the liver, intermediate between the whole apparatus of digestion, on the one hand, and the right side of the heart and lungs on the other, explains its liability to congestion from fulness of the portal system no less than from impeded circulation through the lungs.

348. The *brain* differs in some important respects from every other viscus. The viscera of the abdomen are contained in a yielding cavity with muscular walls; those of the chest in a cavity consisting partly of bone and partly of muscle, but allowing of considerable increase and decrease of size in all directions; but the brain is shut up in an unyielding cavity of bone. All these cavities are air-tight; but that of the cranium alone is both air-tight and unyielding, at least in the adult. It follows, then, that while all the cavities of the body must always be full, the cranium alone must always contain the same amount of matter, for the atmospheric pressure of 15 lbs. on every square inch of the surface of the body keeps the brain full, as it does a syphon. Now, the brain consists of a mass of nervous matter, supplied with blood by numerous vessels, and there is no reason to believe that this matter can suffer more compression than so much water; so that the strongest pressure which can be exerted upon it in the living body would probably not be rendered perceptible by the most delicate instrument. It is also an undoubted fact that the brain of a healthy man is not affected by a change in the pressure it ordinarily sustains. The descent in a diving-bell thirty-four feet below the surface of the water entails an extra pressure of 15 lbs. on every square inch of the body, but the brain does not suffer. On the other hand, the ascent of a lofty mountain, or going up in a balloon, materially lessens the pressure on the body, and, consequently, on the vessels of the brain, and yet the brain is not affected. The inhabitants of some of the valleys among the Andes, who live as far above the sea as the summit of Mont Blanc, suffer only half the pressure the body has to bear at the level of the sea, and yet they enjoy health bodily and mental. Again, the head of the infant suffers severe pressure during birth, and the yielding cranium of the child allows of large accumulations of fluid, and yet the brain suffers nothing during birth, and often very little in hydrocephalus.

349. Mere pressure, then, does not affect the functions of the brain, and yet when blood, or serum, or lymph are found on its surface or in the ventricles, or a tumour in its substance, or a larger quantity of blood than usual in some of its vessels, death is said to have been caused by pressure. This statement is inexact. There is encroachment or displacement of blood, but no pressure. The brain, like other organs of the body, is dependent for the due performance of its functions on its supply of

blood, and a tumour or fluid within the cranium, by occupying space there, deprives the brain of a quantity of blood equal to its own bulk; and the functions of the brain suffer in proportion to the loss. Those most open to observation are voluntary motion and sensation, both of which are lost or greatly impaired. The less obvious functions—the supply of nervous power to the more important viscera, especially those of circulation and respiration—are equally impaired: hence the infrequent pulse and respiration.

350. When blood is poured out suddenly, as in the common form of apoplexy, the symptoms are often more strongly marked, though the quantity of blood is very small, than in cases of slow effusion, or slow growth within the cranium, in which the brain adapts itself by degrees to the changes that are going on. If, in cases of apoplexy, the quantity of blood actually effused seems too small to account for the serious disturbance of the functions of the brain, we must take into account the injury which the texture of the brain itself has suffered, as well as the disturbance in the balance of the circulation that must have preceded and accompanied the rupture of the vessels. That this disturbance is in itself sufficient to account for the symptoms is evident from reported instances in which all the symptoms of apoplexy have been present without a single morbid appearance after death, except a disproportionate quantity of blood in the veins and sinuses.

351. Though the bony walls of the skull may, as already stated, be looked upon as unyielding, and the brain as incompressible, it is obvious that some slight change of position may take place at the openings by which the blood-vessels and nerves pass in and out of the skull, and that the intimate connection existing between the vessels of the brain and those of the scalp and face may become a source of relief and safety in sudden determinations of blood to the head. The flushed and turgid face of apoplectic seizures, and the engorgement or rupture of the vessels of the scalp, in cases of death by hanging or strangulation, are familiar consequences of this vascular connection.

352. There are cases of apoplexy, then (that is to say, cases in which the functions of the brain are greatly impeded), for which no other cause can be assigned but a want of balance in the cerebral circulation. The arteries contain scarcely any blood, while the veins are full; and it must be obvious that the brain thus imperfectly supplied is in as bad a condition as if it received no blood at all, or its vessels were filled with warm water.

353. When the venous blood is less decidedly in excess, the functions of the brain, of course, suffer less; and these slighter disturbances in the balance of the two circulations probably account for the conditions of the mind waking and sleeping. On the other hand, if the circulation through the arteries be increased, instead of torpor we have excitement characterised by heightened sensibility, strong muscular contractions, violent delirium, raving madness.

354. The balance of the circulation may be disturbed in various ways. Blood may be accumulated in the veins by pressure on the jugulars or on the carotid arteries; for as the change of arterial into venous blood is constantly going on, an arrest of the circulation in either direction will increase the quantity of venous blood in the brain, and this will be followed by sleep, more or less profound, by coma, or apoplexy. External pressure, then, is one disturbing cause. An arrest of the heart's action, by putting a stop at once to the circulation through the brain, produces syncope, which differs from apoplexy merely in degree, the one arresting every function of the body, the other merely oppressing them. A very feeble action of the heart will be attended with a like result; for the arteries receiving little blood, and the change from arterial to venous blood still going on, the brain will contain but a small quantity of arterial blood, and must consequently perform its functions imperfectly. Hence the deep sleep, or coma, which often attends extreme debility, and the turgid condition of the veins of the head when death follows upon hæmorrhage or other exhausting cause. In these cases, however, an effusion of serum generally accompanies the turgescence of the veins.

355. The incautious use of the lancet in cases of inflammation of the brain would be calculated to produce this very result. The bold practitioner, not content with reducing the circulation through the arteries and veins to an equilibrium, carries depletion to the extent of greatly lessening the quantity of the circulating fluid, and enfeebling the heart's action. The arteries consequently receive little blood, the veins contain an undue proportion, the circulation through the brain becomes languid, serum is poured forth into the ventricles or on the surface, and the patient dies comatose.

356. *Sleep* comes on, for the most part, at that period of the day, and in that posture, in which the circulation is most sluggish, viz., at night, and lying down. As a general rule, the pulse falls towards evening, and it is also less frequent in the horizontal than in the erect posture. These two circumstances, then, which favour a slow circulation, also favour sleep, and partly explain its occurrence. But other causes must be taken into account, such as the darkness and silence, the absence of the usual impressions on the senses, and the exhaustion of the nervous system, this exhaustion reacting on the circulation, and the circulation, in its turn, reacting on the brain. Sleep, then, may be considered as due partly to exhaustion of the nervous system, partly to the absence of impressions on the organs of sense, and partly to the languid circulation through the brain. Intense cold, another familiar cause of sleep, probably acts partly by causing an accumulation of blood in the internal organs, and partly as a direct sedative. A languid cerebral circulation will result on either supposition. In the cold stage of ague, the same state of circulation exists, and the same condition of brain.

357. Among other causes of sleep may be mentioned repletion, and

a certain stage of intoxication, the one leading to the circulation through the brain of the products of digestion not fully converted into blood; while spirituous liquors act as a poison, stimulant in a small dose, and narcotic in a larger one.

358. The cerebral circulation varies much with the posture of the body. In the erect posture, the heart, in sending blood to the brain, has to oppose the force of gravity; but in the horizontal posture it has much less resistance to overcome. Hence, when the heart is feeble and the system drained of blood, a sudden change from the recumbent to the sitting or erect posture will sometimes cause fatal syncope; and, on the other hand, a patient who has fainted in the erect posture is soon restored by being laid on the back. When the head is lower than the rest of the body, the return of blood to the heart is opposed by gravity; the balance of the circulation is therefore destroyed, and coma is threatened. This unfavourable position, combined with sudden exertion, as in stooping to tie a shoestring or pull on a boot, is an occasional cause of apoplexy.

359. The fact that the flow of blood to the head is favoured by the recumbent, and retarded by the erect posture, suggests the proper treatment of disease of the brain. When there is high arterial action, the head should be raised; where there is great exhaustion, the body should be laid horizontally. Such changes of posture are often attended with the best effects: thus instances are recorded in which pain, intolerable in the horizontal posture, has been at once removed by assuming the erect position.

360. When, again, it is desirable to produce a sudden and strong effect on the system by the abstraction of blood, or to obtain the greatest effect with the least expenditure of blood, the patient should be placed in the erect posture, for the heart soon loses the power of sending the blood upwards to the brain, and fainting ensues.

361. Wakefulness, excitement, and delirium are the direct opposites of the states of drowsiness and sleep, and arise from an opposite state of the cerebral circulation. The degree of violence displayed bears a pretty exact relation to the rapidity and force of the arterial circulation, and to the strength of the patient. In the strong and robust, the outward manifestations in delirium are violent, and the muscles contract with great force; but if the strength is much exhausted, the loud talking of furious delirium is exchanged for low muttering; the violent muscular efforts for subsultus tendinum; and the distinct impressions on the senses for muscæ volitantes, and tinnitus aurium.

3. STRUCTURAL PHYSIOLOGY AND PATHOLOGY.

362. In the two previous chapters the human body has been examined: first, as a chemical laboratory, in which the functions of digestion, assimilation, and sanguification are carried on; and, secondly, as an hydraulic system, by which the blood is collected and distributed. It

is next to be considered as an assemblage of minute structures, by which all its parts and organs are built up.

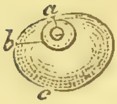
363. It has been already stated that the circulating system, consisting of arteries, capillaries, and veins, forms a continuous and unbroken, though most minutely-divided, reservoir of blood in motion. The arteries serve as carriers of pure blood to the several tissues, the veins as carriers of impure blood *from* them, while the capillaries, the immediate agents of growth and nutrition, connect the two classes of vessels.

364. As the capillaries have no open mouths, the tissues can be nourished only by transudation through their walls. The fluid employed in this work of nutrition is the *liquor sanguinis;* in other words, the blood itself less its red particles. As the liquor sanguinis contains albumen and fibrine, and all elementary substances necessary to nutrition, it is obviously equal to the use thus assigned to it. Many of the capillaries transmit only this colourless liquid.

365. The liquor sanguinis exsuding through the coats of the capillaries, and brought into contact with the tissues, subserves the purposes of nutrition and growth, by being converted into cells (Schleiden and Schwann) or "germinal matter" and "formed material" (Beale).

366. According to the first-named authorities, all the tissues of the body are made up of cells, which consist originally of three distinct parts:—*c*, the cell-membrane; *b*, the nucleus, or *cytoblast;* and *a*, the nucleolus. The cells are developed in a fluid termed the *cytoblastema*, or cell-producer. In the case of the healthy tissues and of the new textures generated by healthy inflammation, this fluid is the liquor sanguinis. The cell containing, and being surrounded by, a fluid similar to that from which it was formed, increases in size, and similar cells, with the same constituent parts, form either within it or external to it.

Fig. 5.

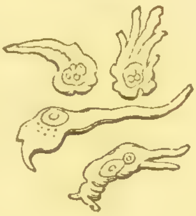


367. The cells, which have the rounded form of Fig. 5, when floating in the cytoblastema, may press against each other, so as to assume the hexagonal form that vesicles so circumstanced always put on. If the intervals between the cells are supposed to be occupied by a firm unorganized deposit, we have the essential elements of such hard tissues as cartilage or bone. If, instead of being round or oval, they assume elongated forms, we have the elements of the fibrous tissues; and, lastly, if cells arranged in lines with their ends in apposition are supposed to have their opposed terminal walls removed by absorption, we have such hollow tubes as arteries, veins, absorbents, and the sheaths of the nervous matter.

368. Cells also enter into the composition of some of the fluids both in health and disease. The red particles which float in the liquor sanguinis of the blood are nucleated cells; so also are the lymph globules; and the mucous and purulent secretions thrown out from inflamed surfaces contain mucous and pus-globules.

369. In healthy pus formed on the surface of a wound, these pus-globules become organised, and constitute successive layers of granulations. The superficial layers present cells which resemble the pus-granules; the deeper strata consist of cells of which the nuclei are very distinct, and the envelopes polygonal from mutual pressure; while in the deepest layers of all the envelopes of the cells are seen passing through all the gradations of the fibres of areolar tissue.—(Henle.)

Fig. 6.



370. The cell-theory also admits of application to malignant growths. The liquor sanguinis, or cytoblastema, which exsudes through the capillaries, instead of furnishing the materials for healthy cells to build up healthy tissues, supplies the elements of cells of the irregular shape of those depicted in the annexed engraving, and which form a constituent part of cancer.

371. For this cell-theory of Schleiden and Schwann, Dr. Beale has substituted a simpler account of the minute constituent parts of living beings. He supposes a spherical particle of germinal or active matter, which itself consists of spherical particles of extreme minuteness, and an outer sphere of formed or inactive materials. This germinal matter may surround itself with successive layers of formed material. If there happen to be two such layers, the outer will correspond to the cell membrane, and the inner to the nucleus, while the central germinal matter is itself the nucleolus. This central germinal matter alone possesses active formative properties, and appropriates and assimilates the liquor sanguinis with which the tissues are bathed.

372. Both these theories admit of application to diseased as well as to healthy growths; but many morbid changes involve not the minute elementary parts only, but the aggregate structures which they serve to build up.

373. One class of structural changes, for instance, consists in a simple mechanical enlargement of hollow organs, such as the stomach, large and small intestines, and urinary bladder, from habitual distension; of the veins of the extremities from pressure on the large venous trunks; and of the anastomosing branches of arteries as a consequence of the application of a ligature to the main trunk.

374. A second class of structural changes consists in *abnormal nutrition*, in excess or defect, without any change in the minute texture of the parts affected. The former is called *hypertrophy;* the latter, *atrophy*.

375. The principal cause of *hypertrophy* is increased action; of which illustrations are afforded by the muscles of the athlete, by the heart and bladder when they encounter an obstacle to the evacuation of their contents, by the uterus during pregnancy, by the mammæ of the female when secreting milk, by the mucous membrane of the bladder exposed

to irritation from stone or gravel, and by the small arteries in organic disease of the viscera which they supply.

376. *Atrophy* arises from opposite causes; from disuse of parts, as of the muscles in the sedentary, paralytic, and bedridden, from obstruction to the flow of blood by ligatures, or from the operation of such powerful medicines as iodine and the salts of lead. Internal organs may also become atrophied from a cause described in § 384. Atrophy is marked by paleness of the parts affected, as hypertrophy by increase of colour.

377. Hypertrophy and atrophy are sometimes limited to one constituent part of a texture. Thus bone may become unusually hard from the crowding of many earthy particles into the space commonly occupied by a few, or soft, from absence of the earthy matter.

378. A third class of structural changes consists of the effects of common inflammation (§ 291, *et seq.*), due to common causes.

379. A fourth class comprises the effects of inflammation due to specific causes—to poisons introduced into the body from without by insertion or *inoculation*, by application to the skin, by inhalation through the lungs, or by admixture with food or drink. The local effects, direct and transferred, produced by wounds received in dissection, by syphilis, by mercury, arsenic, lead, copper, and phosphorus used in the arts, by the contagion of plague typhus fever and the exanthemata. and by drinking water polluted by the contents of drains and cesspools, afford examples in point.

380. A fifth class consists of those which are brought about by causes acting within the body itself, originating in the blood-vessels, and producing structural changes either by simple mechanical impediment or by a taint imparted to the blood. To the first class belong the fibrinous clots formed in arteries or veins, or in the heart itself, which may either continue in the spot where they were formed, or be transferred by the current of the circulation to some smaller vessel often very remote from the origin of the mischief, there to give rise to obstructed circulation and consequent structural change. To the second class belong those local abscesses in the liver, lungs, serous cavities, and joints which spring up as a consequence of the blood becoming the carrier of purulent matter formed in some venous trunk or in the open mouths of veins wounded or otherwise exposed. The mechanical impediments of the first class are now familiarly known by the names of *thrombus* and *embolus;* the purulent deposits of the second class as *secondary abscesses.*

381. The structural changes or morbid growths resulting from these several causes have been grouped in two leading classes, under the designations *analogous* and *heterologous*, analogous formations being those that resemble the natural tissues, heterologous those that differ from them.

382. The class of *analogous* formations is a very important one, and

comprises some of the most fatal diseases of the secreting organs, especially of the liver and kidney, as well as several morbid states of the heart and of the arteries, giving rise to fatal structural changes in the organs which they supply.

383. *Fatty Degeneration.*—Deposits of fat or oil-globules constitute the disease known as fatty degeneration of the liver, as well as certain forms of Bright's disease of the kidney. The oil-globules are deposited in the epithelial cells of the secreting surfaces, and in the cellular tissue connecting the vessels. The annexed illustrations show the mode in which the oil-globules are deposited in the cells of these organs. In Fig. 7, *a* represents healthy cells of the liver, free from oil-globules; and *b*, cells from a liver in a state of fatty degeneration. In Fig. 8, *a* represents healthy epithelial cells of the kidney, and *b*, cells loaded with oil-globules. In disease of the kidney, the secreting tubes lined with cells containing oil-globules are expelled with the urine, so as to furnish evidence during life of the character of the disease.

Fig. 7.

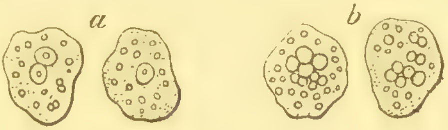
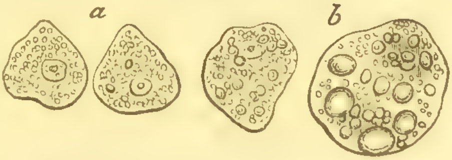


Fig. 8.



384. The first effect of these abnormal deposits is to increase the size of the diseased organs without materially affecting their functions; but as the disease advances the fatty deposits encroach more and more on the vessels and secreting apparatus, so as on the one hand to restrict the supply of blood, and on the other to impair the secreting power of the cells. Hence, in extreme cases, the organs affected are rendered *anæmic*, and become quite unequal to the performance of their functions; and instead of increasing in size, they lose bulk from the cessation of nutrition and the absorption of the oil-globules, which were the original cause of the disease.

385. But deposits of oil or fat are not limited to the secreting organs: they take place also in the tissues. They are laid down, for instance, in the muscular structure of the heart, and enfeeble it by encroaching on and displacing the healthy muscular tissue.

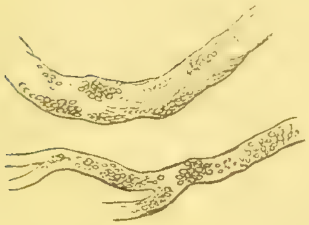
386. Associated with earthy matter, as *atheromatous* deposits, they occur in the coats of arteries, which are often found to be the seat of this species of degeneration in subjects affected by similar disease of the liver and kidneys. These deposits are situate either in the cellular membrane between the inner and middle coats, or in the fibres of the middle coat itself. When they occur in the middle coat of the larger arteries, they take the place of the healthy structure, impair its elasticity, and lead to dilatation. In the smaller vessels they are often so

abundant as to obliterate their channels, and thus cut off the supply of blood from the parts to which they are distributed. When this occurs in the coronary artery of the heart its muscular substance becomes atrophied. These deposits are found to obey the law of symmetry, attacking equally and similarly the vessels on both sides of the body.

387. Atheromatous deposits in the coats of arteries often become the seat of ulceration, leading to perforation and sudden death from hæmorrhage. When the ulcers make their way through the inner coat of the arteries, they project from it as ragged uneven tumours, and when they occur in the aorta, are frequent causes of abnormal blowing and sawing sounds. In other cases the atheromatous spot becomes the nidus of calcareous deposit, in which case the vessel is said to degenerate into bone.

388. The small vessels of the brain are also subject to fatty degeneration. Oil-globules are deposited in the transverse fibrous coat of the arteries, and in the corresponding coat of the veins. They may be seen under the microscope, either as "minute, shining, black-edged particles, like molecules of oil, thinly and irregularly scattered beneath the outer surface of the small blood-vessels," as globules of larger size, more closely packed together, or in round or oval clusters, "like large granule-cells." The subjoined engraving, from a paper by Mr. Paget, in the "London Medical Gazette," 1850, shows the microscopic appearance of small arteries under this form of degeneration.

Fig. 9.



389. This deposit of oil-globules destroys the even outline of the vessels, and, their proper structures gradually wasting, the smaller vessels dilate into minute aneurismal pouches. The proper vascular structure being thus weakened, softening of the brain ensues, followed by rupture of the vessels. This is one form of apoplexy.

390. Another analogous formation consists in a deposit of semi-cartilaginous matter on the free inner surface of the arteries. Its most common seats are the valves of the heart and aorta, the larger vessels at the points where they give off branches, and the smaller arteries throughout their whole extent. Calcareous deposits, having the hardness of bone, are also of frequent occurrence in the heart and arteries as independent formations; that is to say, they take place where the structures have not previously undergone any other form of degeneration. The fibrinous deposits which attach themselves as *vegetations* to the lining membrane of the heart, especially to that covering the valves, afford another familiar example of *analogous* formation.

391. Recent researches have attached a new and unexpected interest to these valve-deposits. They occasionally become detached from the mitral valve, and, being borne forward by the current of the circulation, lodge in an artery of the brain, impede or stop the circulation through it, cut

off the supply of blood to a part of the brain, which becomes softened, and so gives rise to hemiplegia. This formidable accident is now grown familiar to us under the name of *embolus*, or *embolism*.

392. Another instance of fatty degeneration has been pointed out by Mr. Canton in the *arcus senilis*, or white line, seen just within the circumference of the cornea in many aged persons, in some who have passed the middle of life, and occasionally as early as 35 years of age. It is sometimes associated with fatty degeneration of more important organs. Fatty degeneration of the ovum has also been shown to be a frequent cause of abortion.

393. It will be seen, then, that deposits of oil-globules or fat, whether in the cellular membrane uniting the vessels of secreting organs and in the coats of arteries, or in the epithelial cells of secreting membranes; whether continuing in their original form, and encroaching gradually on the healthy structure of the organs they attack, or becoming the seats of ulceration, or of calcareous deposit—play a most important part in the history of organic disease.

394. These fatty deposits may sometimes be confidently traced to imperfect oxygenation of the venous blood. Fatty degeneration of the kidney, for instance, is a common occurrence both in men and animals living in dark, filthy, and ill-ventilated places, where the air is unfit to support the process of combustion in all its vigour, at the same time that the constitution is enfeebled. Again, fatty degeneration of the liver and kidneys, atheromatous deposits in the arteries, and fatty degeneration of the heart, are often found associated in the spirit-drinker, who constantly introduces into his system a large supply of a liquid hydrocarbon, of which the gaseous elements attract the oxygen that ought to be devoted to the combustion of the carbonaceous matters derived from the food, and from the effete textures of the frame.

395. French epicures by producing fatty livers in geese, through a combination of high feeding and heat, have given us another lesson as to the causes of this diseased condition—causes which find their combined application in the production of liver disease in Europeans who carry the dietetic customs of England to the hot climate of India.

396. *Heterologous Formations.*—These morbid growths may be divided into two classes—*non-malignant* and *malignant*. The first comprises *tubercle*, the second the several forms of *cancer*. Tubercular diseases generally fall under the care of the physician; malignant diseases more commonly into the hands of the surgeon. But both classes may attack either the internal or external organs of the body.

397. *Non-malignant Diseases. Tubercle.*—This is deposited on the surface of membranes, or in the texture of organs. It has two different forms—the one, whitish-grey, semi-transparent, and dense; the other, yellow, opaque, and friable. The first may be changed into the second, but the second is never transformed into the first. The grey tubercle

is found in small isolated portions in the air-cells of the lungs as miliary tubercles, or on the surface of serous membranes. The yellow variety is found in the same situations, as well as on the surface of mucous membranes, and in the substance of organs—in the follicles of the intestines, in lymphatic glands, in the liver, spleen, brain, uterus, &c. It assumes different forms in different situations. It may be collected in a distinct mass, or diffused through the tissues of an organ as a homogeneous cheesy matter; or it may be so thoroughly blended with the textures as to assume the very form of the organ attacked, which is then said to degenerate into it.

398. Tubercle consists of albumen, fibrine, gelatine, salts of soda and lime, and water, with a little fatty matter. Under the microscope *miliary* tubercle presents the appearance of granules blended with nucleated cells, or *tubercle corpuscles.* The yellow variety also consists chiefly of granules, interspersed with minute spherules, irregular flakes, and numerous oil-globules, edged with a few perfect cells.

399. Tubercle is rarely deposited before birth; is not common before the fourth year; is frequent between the fourth and fifth; less frequent, again, from this time till puberty; most frequent of all between puberty and the age of fifty. The lungs are its most common seat, so that after fifteen it is almost never met with in other organs without existing in them at the same time. The state of constitution (*tuberculous cachexy*) which leads to tubercular deposit may be either inherited or acquired.

400. Tuberculous matter is deposited slowly, without causing pain or inconvenience, and may remain quiescent for a very considerable period. At length, in the course of a common cold, or slight febrile attack, the tubercle begins to act as a foreign body, and sets up inflammation in the surrounding tissues. When this change takes place in the absorbent glands, serum and pus are poured out, and an abscess is formed, which slowly approaches the surface, bursts, and discharges the tubercle softened and broken down by the effused fluids. The walls of the abscess then generally contract and heal. Tubercles in the lung undergo the same change, the matter being expectorated; but sometimes they are converted into a chalky or earthy matter, and remain quiescent for the rest of life. When the deposit is on the mucous membrane of the larynx or intestines, the membrane ulcerates.

401. Scrofulous subjects are not only liable to tubercular deposits, but also to the chronic forms of inflammation, suppuration, and ulceration. The lymph effused, as the result of inflammatory action, is curdy, and wanting in consistence, the pus serous and flaky, and granulations, when formed, are large, pale, and flabby. Pustular, scabby eruptions of the ears and mouth, discharging a thin acrid matter, enlargement, inflammation, and suppuration of the absorbent glands, especially of the neck, and a similar affection of the mesenteric glands, are also common in scrofulous children.

402. It has been shown experimentally that tubercular deposits may be produced at will in animals by confining them in close dirty places, and feeding them on unwholesome food.

403. *Malignant Diseases.*—These heterologous formations resemble tubercle in affecting almost all the organs of the body; in being frequently traceable to hereditary predisposition; and in their tendency to excite destructive inflammation of the parts affected. On the other hand, malignant growths are distinguished by extending into surrounding textures, stirring up inflammation in them, and progressively destroying them; by following the course of the absorbents and attacking the lymphatic glands; and by reappearing, after removal, in or near the cicatrix, or in some internal organ nearly connected, through the absorbent system, with the part first attacked. The true malignant growths may be all comprised under the general name of Carcinoma or Cancer.

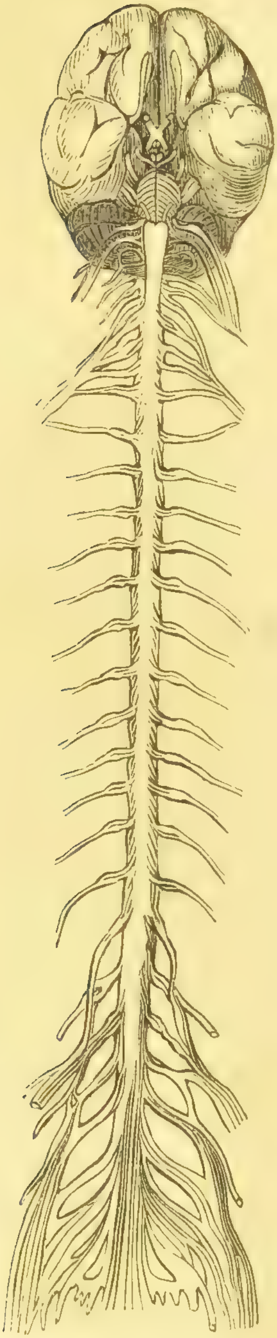
404. *Carcinoma* (*Cancer*).—This term was originally applied to a malignant ulcer supposed to bear a resemblance to a crab (*καρκίνος*, cancer). It now comprises many changes of structure differing widely in their physical characters: as scirrhus, or hard cancer; medullary, or soft cancer (with its most vascular form, fungus hæmatodes); epithelial cancer; melanotic cancer (characterised by the presence of pigment); osteoid cancer; and colloid cancer, characterised by the transparent or gelatinous substance of which it consists. They are all made up of compound cysts varying in their solid and fluid contents, growing from broad bases, or from narrow peduncles, which, springing from a single spot, give to the tumour a radiated appearance. The various appearances presented by these tumours are partly due to the inflammation which takes place in them and in the surrounding textures, and partly to the entire or broken state of the cysts themselves.

405. *Melanosis.*—This is an unorganized product, of a dark brown, dull bistre, or sooty-black colour, deposited in masses with or without cysts, or in patches on membranous surfaces. Sometimes it is met with in small points, and occasionally it has been found liquid. Its most frequent seat is the liver; but it is sometimes found in the eye, skin, brain, lungs, kidneys, and other glandular organs. Its chemical constituents are albumen, fibrine, and the salts usually found in the blood, with a colouring matter abounding in carbon. When associated with malignant growths, the cells, instead of continuing free, are attached to the surrounding tissue. Deposits of a black colouring matter are often found in the bronchial glands and on the surface of the lungs both before and after birth. Such deposits are not malignant.

406. This account of structural physiology and pathology would be incomplete if some notice were not taken of the large number of non-malignant tumours and cysts with which the surgeon has to deal: such as the fibrous, fibro-cellular, fibro-nucleated, fibro-plastic, myeloid, fatty, osseous, cartilaginous, fibro-cartilaginous, and vascular, among tumours, and the simple or barren, and compound or proliferous among cysts. Some notice should also be taken of the intractable, but not malignant, disease that attacks chiefly the integuments of the face, under the name of *lupus*, with its chronic form, and the more acute variety known as *lupus exedens*.

4. THE NERVOUS SYSTEM.

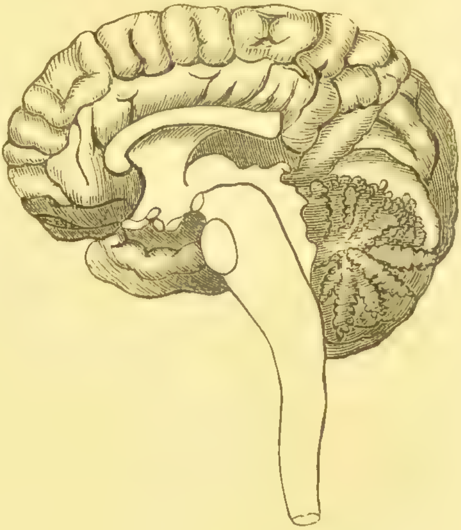
Fig. 10.



407. It is not possible to represent in a single diagram (such as that which, at p. 57, is used to illustrate the mechanism of the circulation) that complex arrangement of nerve-masses and nerve-fibres known as the nervous system. The brain and spinal cord, shown in plan in Fig. 10, and the brain, shown in vertical section in Fig. 11, are but the conspicuous parts of a whole which requires the sympathetic nerve for its completion, and of which the delicate terminations are to be found, accompanying the smallest vessels, in every organ and texture of the body.

408. The *brain*, of which the base, with the nine pairs of nerves arising from it, is shown in Fig. 10, and the vertical section, displaying the three leading divisions (cerebrum, cerebellum, and medulla oblongata), in Fig. 11, is the centre to which all sensations are referred, and from which all voluntary efforts originate. The *spinal cord*, with thirty-one pairs of nerves springing from it, for distribution to the trunk and limbs, may be said to occupy an intermediate position between these nerves and the brain; while the brain and spinal cord together form the joint source from which all the nerves of sense and of voluntary motion arise, from which all the mandates of the will are sent forth, and to which the intelligence of every sense is conveyed. From these centres, too, those nerves which control the movements of respiration and circulation take their rise. The *sympathetic* nerve, connecting itself with the several nerves of sensation and volition which spring from the brain and cord, presides over the functions of many of the organs most essential to life, is the source of some of those movements which are independent of the will, of many of those sensations by which life is preserved, and of the chemical changes that are peculiar to living beings. The spinal marrow, again, is the centre of union of certain

Fig 11.



nerves which form with it the excito-motory system, the seat of the reflex function. One set of nerves passing from the skin and mucous membranes convey to the cord certain impressions which, not passing onward to the brain, are not perceived; while another set, arising from the cord, and being distributed to the muscles, give rise to contractions which, as the impulse does not originate in the brain, are involuntary. This excito-motory system and reflex function bear a very important part in all those movements which subserve the most pressing wants of the frame, such as the ingestion of food, and the supply of air in breathing. Lastly, the *cerebellum* has been shown to be the centre and source of a co-ordinating function, or harmonising control, exercised over those voluntary muscles which have come to act in unison for the production of certain complex movements, such as those of standing, walking, working with the arms and fingers, speaking, and singing.

409. The following scheme, then, represents the leading functions of the nervous system, as well as the portions of the nervous centres by which they are performed:

(1.) Sensation and voluntary motion, of which the brain is the centre.

(2.) Co-ordination of voluntary movements, of which the cerebellum is the centre.

(3.) The excito-motory, of which the true spinal cord is the centre.

(4.) The nutrient and secretory, of which the sympathetic or ganglionic system forms the principal portion.

410. (1.) The first order comprises all the nerves of *sensation* (the olfactory, the optic, the auditory, the gustatory, and the nerves of touch), and all the nerves of voluntary motion, with their common centre in the cerebrum. The greater part of the nerves of touch, or common sensation, and the nerves of voluntary motion form the external portions of the spinal marrow, and through it communicate with the brain.

411. (2.) Of the second order it must suffice to state that pathology and experiment combine to prove that the cerebellum, with the posterior columns of the spinal cord, which are downward prolongations of it, is

the centre of a co-ordinating function voluntarily exercised over the motor nerves. The reason for associating the posterior columns of the cord with the cerebellum as the seat of this function are:—that they are not sentient, that motion is not destroyed when they are divided, but that by such division muscular movements are thrown into disorder.

412. (3.) The third order consists of two sets of nerves, of which the one passes chiefly from the mucous surfaces to the interior parts of the medulla oblongata and spinal cord, and the other from those parts of the medulla and cord to muscles which are chiefly subservient to ingestion and egestion. Some fibres of the same order of nerves are probably distributed to the skin and voluntary muscles. That part of the spinal marrow to which these nerves run has been called the *true* spinal marrow, in contradistinction to those parts of it which are formed by longitudinal (commissural) fibres going to the brain. The motions due to this system are said to be *excited*, and the nerves are distinguished as *afferent* and *efferent*, *incident* and *reflex*. Through these nerves the mouth of the infant, when applied for the first time to the mother's breast, performs the movements of suction —movements which take place even in the acephalous infant; through them, too, the contents of the bladder and rectum are expelled; and foreign bodies discharged from the air-passages by sneezing and coughing.

413. The third class of nerves, or the ganglionic, consist of the *internal* ganglionic, or sympathetic, including a few fibres of the pneumogastric; and the *external* ganglionic, embracing the fifth nerve and the posterior roots of the spinal nerves. These latter are supposed to be chiefly destined for the nutrition of the external organs.

414. The leading functions of the nervous system, then, are:—1, sensation and voluntary motion; 2, co-ordination of muscular movements; 3, excitements to action without sensation, and combined motions without volition; and 4, nutrition, secretion, and the motions connected with them. To these must be added the mental functions, which have their seat and organ in the cerebrum, and which will have to be considered in the next section.

415. The nerves consist of bundles of minute fibres, enclosed in sheaths, distinct through their entire course, and connected at their origin with a nerve vesicle. They remain unbroken till they arrive at the part to which they are distributed, when they begin to branch freely, and, uniting with similar branches of other nerves, form at last networks of excessive tenuity.

416. Experiment has revealed to us the functions of the more important nerves, but has left much yet to be discovered. It has also thrown light on the laws that govern the transmission of nervous force though it has left the nature of that force involved in the same obscurity which hangs over the real essence of light, heat, or electricity, with which last, however, it appears to have many points in common.

417. The effect of the division of a nerve is well known. If it b

one of sensation, irritation of its branches or trunk below the point of division causes no pain; if it be one of voluntary motion, neither the will nor a stimulus applied to it above the point of division can cause the muscle to which it is distributed to contract. On the other hand, if the voluntary nerve be irritated below the point of division, or the sentient nerve above it, motion takes place in the one case, and sensation in the other; the sensation being referred to the parts to which the nerve is distributed. This law of sensation is strikingly illustrated in cases of amputation of a limb. Irritation of the cut end of the nerve is referred to the fingers or toes of the lost limb for years after its removal.

418. The fact that irritation of the trunk of a sentient nerve causes pain, not in the trunk itself, but in the parts to which its branches are distributed, admits of practical application, and tends to destroy confidence in the division of nerves as a remedy for pains in the parts they supply. But the failure of this remedy in some cases has been explained by the discovery of some permanent cause of irritation, such as a tumour or spicula of bone, at the origin of the nerve.

419. Pressure applied to a sentient nerve causes pain in the parts supplied by its branches, but a firmer pressure produces pain in the trunk of the nerve itself. Severe injury to a nerve of sensation or voluntary motion destroys its power as a conductor of nervous force, but it affects the nerve itself only locally; for irritation of the part of the uninjured sensitive nerve connected with the brain causes sensation, and irritation of the part of the nerve of volition connected with the muscles excites muscular contraction. When, however, a nerve of motion is stretched violently through its whole length, it can no longer conduct the stimulus of muscular contraction, and sometimes the muscle itself loses its irritability, and cannot be made to contract by the most powerful stimulus.

420. Experiments on animals have brought to light other properties of the nerves which may be advantageously borne in mind by the pathologist. It has been proved that all stimulants applied to the nerves of the dead body act nearly in the same way, though with different intensity; but the electric and galvanic fluids being the most effectual, are generally selected for experiment. It has also been shown that the motor nerves, under the stimulus of galvanism, do not act as mere conductors of the galvanic fluid, for the muscles contract when the current is made to pass transversely through them. The muscles, however, cannot be made to contract by any degree of mechanical irritation applied to a nerve of sensation, while the slightest irritation of a nerve of motion gives rise to very strong contractions. Hence it appears that the motor nerves themselves can excite muscular contractions on the application of stimuli, independent of the brain and spinal cord. It has been further shown that this property may be exhausted by the continued application of a stimulus, to return after an interval of rest.

421. These experiments on dead animals are in accordance with the results of observation in the living human body. The exhausted ner-

vous power must be restored by rest; the exhaustion of the entire frame repaired by sleep; and stimuli, whether mechanical, chemical, or electrical, cause the nerves to which they are applied to manifest their characteristic properties. Irritation of a nerve of common sensation causes pain; of a nerve of motion, muscular contraction: and the stimulus of galvanism excites in each organ of sense the sensation proper to it - taste in the tongue, a peculiar odour in the nose, light in the eye, a musical sound in the ear. Lastly, irritation of the origin of the pneumo-gastric nerve gives rise to a derangement of the digestive process manifested by the elimination of sugar from the kidney.

422. The stimulants, heat, cold, and electricity are used as remedial agents. Both heat and cold cause the muscles to contract, and, when excessive, destroy their irritability. Cold water injected into an artery causes contraction in the muscles which it supplies; hence, in uterine hæmorrhage following delivery, cold water is injected with effect into the vessels of the still-adhering placenta, and cold suddenly applied externally or internally causes contraction of the uterus. The good effect of electricity and galvanism is manifested in some cases of paralysis.

423. Stimuli of great intensity can destroy the excitability of the nerves, as happens with the optic nerve when a flash of lightning produces permanent blindness; and with the brain and spinal cord when it causes sudden death. Permanent paralysis may arise from the same cause. A weaker stimulus applied for a longer time may produce the same effect. Thus, snow blindness sometimes follows the continued strong reflection of light on the retina, and paralysis of the muscles violent and long-continued exercise. Weaker stimuli, or the same stimuli applied for a shorter period, impair the excitability of the nerves and cause fatigue. Thus the eye fixed for a long time on the same colour becomes insensible to it; and if the same set of muscles is kept in action only for a few minutes, as when we hold an arm extended, or stand quite still, we feel extreme fatigue, from which the slightest change of posture affords instantaneous relief.

424. Nervous exhaustion is always accompanied by severe pain. Thus, the long-continued application of the stimulus of light to the eye, or of cold or heat to the skin, gives rise to acute suffering: and prolonged action of the muscles in walking may occasion the most excruciating agony.

425. A stimulus, then, applied to the nerves of sensation or voluntary motion, produces, according to its degree and duration, entire destruction or great exhaustion of the nervous power, accompanied in extreme cases by severe suffering; and the functions of the nerves are not restored till after rest proportioned to the exhaustion. The brain and spinal cord are the sources of the restorative influence, and motor nerves, permanently cut off from those centres, lose their property of exciting muscular contraction.

426. Stimuli, therefore, first excite the nerves, and then exhaust them. But there are substances known as *narcotics* which have the effect of

deadening the excitability of the nerves, and, in a concentrated form, of entirely destroying it. If, for instance, the ischiatic nerve of a frog be dissected, and allowed to hang in a solution of opium or morphia, the nerve is deprived of its power of exciting muscular contraction, and the leg of a frog steeped in a solution of opium, or of hydrocyanic acid, is similarly affected. The same effect is produced upon the heart by infusions of opium and tobacco; on the intestines by opium and ticunas; on the iris by extract of belladonna; on the hands by the handling of lead; on the lips and tongue by chewing monkshood; and on the fingers by the vapours of strong hydrocyanic acid.

427. Narcotic poisons introduced directly into the circulation, or indirectly through the stomach or other circuitous channel, also act locally on the nerves. Thus, Müller, having divided all the vessels and muscles of the thigh of a frog, poisoned the animal with nux vomica, and found that the irritability of the sound leg was lost much sooner than that of the mutilated one. This loss of irritability in the sound leg can only be explained by the circulation through it of blood containing the poison, and the consequent local effect of the poison on its nerves; and it is doubtless by such local effect on the parts of the nervous system most essential to life, or on the nerves supplying the heart or lungs that narcotic poisons, after being absorbed and circulated with the blood, prove fatal.

428. It has also been proved that poisons act with greater force through the circulation than when applied directly to the nervous trunks. Thus, strychnia applied in powder to the moist spinal cord of the frog excites no twichings of the muscles, while the most violent contractions are produced by very small quantities absorbed into the blood. Other experiments may be adduced to prove that poisons circulating with the blood produce their effect chiefly by acting on the spinal cord and brain. Thus, when an animal is poisoned by strychnia, if the nerves of one limb are divided, the spasms in that limb cease; and if the spinal marrow is cut through before an animal is poisoned with upas, the parts supplied by nerves from the lower portion of the cord are not convulsed. Narcotic poisons generated within the body itself also act on the nervous centres through the circulation. Thus, urea, when it accumulates in the blood from loss of power in the kidneys to eliminate it, acts on the brain, and causes fatal coma.

429. The foregoing observations apply chiefly to the nerves of sensation and voluntary motion, which have the brain and certain portions of the spinal cord for their origin and centre. The sympathetic nerve and the excito-motory system yet remain to be examined.

430. *The Sympathetic.*—The functions of this nerve are threefold: it presides over the involuntary muscular fibre; it is the medium by which all impressions are conveyed from the parts to which it is distributed to the nervous centres; and it regulates the processes of secretion and nutrition in every part of the frame.

431. With regard to the first of these functions—that of directing the involuntary motions of the more important viscera—it has been ascertained that the parts which this nerve supplies continue to move long after they are separated from the rest of the sympathetic system, and even after their removal from the body, whether the motions are rhythmic, as in the heart, or continuous, as in the intestines: and that the contractility of these parts survives that of the voluntary muscles. The effects of stimuli applied to the sympathetic nerve are also more permanent than those of stimuli applied to the nerves of voluntary motion.

432. All the parts supplied by the sympathetic nerve are, to a certain extent, independent of the brain and spinal cord. Thus, the heart will continue to beat long after the division of its nerves, after severe injury of the brain and spinal cord, and even after its entire removal from the body. That the spinal cord, however, does influence the contractions of the heart has been proved experimentally; and that the brain acts upon them is shown by the familiar effect of mental emotions. Certain excitations of the brain and spinal cord are doubtless conveyed to the sympathetic by means of the *rami intercommunicantes* existing between the two systems of nerves, and by the same channels impressions on the sympathetic may be conveyed to the spinal cord and brain, and excite either sensation or movement in parts to which the cerebro-spinal nerves are distributed.

433. The impressions made on the fibres of the sympathetic are not usually conveyed to the brain; in other words, they are not of the nature of sensations; but violent irritation may give rise to sensation in parts supplied by nerves from the sympathetic as well as in those supplied by cerebro-spinal nerves. When these last-named nerves are the seat of the irritation, the painful sensations are usually experienced in the extreme parts of the organs which they supply: thus we have itching of the nose and anus from worms in the intestines, and pain and itching in the glans penis from disease of the kidneys and bladder. But irritation in the intestines, or a disordered condition of the uterine functions, is a familiar cause of reflected sensations of a still more marked character, such as acute pains in the muscles of the chest and abdomen in hysterical females, accompanied by tenderness of the spine itself, and sometimes removed by remedies applied to that part.

434. The same irritation conveyed to the spinal marrow, and accompanied by tenderness there, may also be reflected through the motor nerves, and give rise to spasmodic seizures. Thus, intestinal irritation occasions convulsions, chorea, and tetanus, in infants and young children, and hysteria affecting the muscles of voluntary motion, but especially those of respiration, in adults. Vomiting and hiccough are also produced by irritation of the nerves of the intestines, kidneys, or uterus.

435. The sympathetic nerve has been shown to preside over secretion and nutrition, and consequently over the functions of the parts concerned in these processes: the minute vessels, therefore, and the arterial system generally, fall under its influence. Section of the sympathetic

on one side of the neck causes permanent dilatation of the capillaries of the corresponding side of the face, and on irritating the trunk of the nerve they again contract. But although the organs of circulation are thus placed directly under the influence of the sympathetic, the occurrence of syncope and blushing through mental emotion proves that impressions on sentient nerves may be reflected on the parts which it supplies. These reciprocal phenomena are due to the interchange of fibres between the two systems of nerves. The alteration in the size of the capillaries under the influence of emotion and in inflammation has been already adverted to (§ 272, *et seq.*).

Such being the functions of the sympathetic, it follows that the circulation, both general and local, must be closely dependent upon the condition of this nerve. It is probable that the various states of circulation indicated by a pulse, ranging between a sharp, hard, and excited beat on the one hand, and a full, weak, compressible one on the other, are due to variations in nervous force transmitted by the sympathetic to the muscular tissue of the heart and arteries. It is also probable that the dilatation of the small vessels in inflammation is due to diminished nervous power in the sympathetic.

436. In the general, as in the local affection, we may have first the application of a stimulus, accompanied by increase of nervous force and consequent contraction of vessels, and then, as a necessary consequence, diminished nervous force, and relaxation of vessels. This contraction of the vessels is not overcome by a reaction in the centre of the circulating system, but yields to that diminished contractility which follows as certainly upon increased action as blunted sensibility upon over-exertion of the organs of sense, and fatigue upon long-continued or violent action of the muscles. This contracted state of the vessels is the *spasm* which plays so prominent a part in Cullen's theory of fever.

437. The sympathetic nerve, as the name implies, is assumed to be the organ of many of those combined sensations, motions, and secretions which we call *sympathies*, by which we mean the reflection of impressions from one part of the nervous system to another and different part. It may be otherwise defined as reciprocal feeling or action between different nerves, and therefore between different parts, caused by reflex nervous action. The nerves of the surface and the central organs of the nervous system, for instance, react on each other; the affection of the central organs in fever causing the various conditions of the skin, and shocks to the skin, exciting the brain and spinal cord. Again, cold water poured on the head restores the brain exhausted by long-continued inflammation; and dashed in the face or thrown on the chest, removes an hysterical or fainting fit, excites the nervous centres in cases of narcotic poisoning, and is the most efficacious of remedies in asphyxia.

438. Sensitive nerves sympathise with sensitive, motor with motor, and sensitive and motor with each other. The optic, the olfactory, the auditory, and the ciliary nerves of the two sides are affected at the same time and in the same way, and an affection of one side often leads to a

similar affection of the other: inflammation of one eye to inflammation of the other; deafness of one ear to deafness of the other; an alteration in one pupil to a similar alteration in the other. This sympathy between nerves of sensation supplying double organs extends also to nerves of different kinds and functions: thus, a strong light on the eye produces tickling in the nose; tickling the feet throws the whole body into convulsions; certain sounds put the teeth on edge; a tumour on a nerve may cause pain or spasms in parts of the body in no way connected with it. To such phenomena the term *radiation of sensations* has been applied. Sympathies of motor nerves with each other occur in all associated movements; those of motor with sensitive nerves belong to the class of excited or reflected motions.

439. The sympathies of entire organs with each other are very important. They may be classed as follows:—1. Sympathies between organs having similar structure and function; as the different salivary glands, the heart and blood-vessels, the stomach and intestines. 2. Sympathies between organs belonging to the same system: as the digestive, the urinary, the generative, the respiratory system, and the united respiratory and circulating system, the lungs and heart. Thus vomiting attends the passage of a gallstone into the intestines. 3. Sympathies of important viscera with the central organs of the nervous system: as in the convulsions from teething, or intestinal irritation; the sick headache, caused by the presence of indigestible food in the stomach; and, conversely, the affections of the stomach resulting from irritation or concussion of the brain. Epileptic fits often have their source in irritation of the stomach, uterus, &c. 4. Sympathies between organs not connected in any of the foregoing ways: such as the parotid gland with the testicle; the mamma with the uterus; the larynx, and the glands which secrete the hair, with the parts of generation. To this class, too, belong the sickness attending the passage of a renal calculus into the bladder, the passing of a catheter, or the pain of acute orchitis.

440. The *excito-motory system.* The following plan will exhibit the extent and importance of this system:—

Incident branches.	*Reflex motor branches.*	*Excited actions.*
I. Trifacial, arising from		
a. The eye-lashes. *b.* The alæ nasi.	The trochlearis } oculi. The abducens }	Protective movements of the eyes and eyelids. Of the iris?
c. The nostrils.	Minor portion of the fifth.	
d. The fauces. *e.* The face.	Orbicularis } from the facial. Levator alæ nasi }	Facial respiratory movements. Sneezing, laughing, &c.
II. Pneumo-gastric from		
a. The œsophagus and stomach.	The pharyngeal plexus.	Suction and deglutition.
b. The mucous membrane of larynx.	The inferior laryngeal.	Closure of glottis, &c.
c. The bronchia	The bronchial, &c.	Motions of air-passages in respiration.
d. The heart, kidney, and liver.	The œsophageal and cardiac.	Motions of gullet and stomach.

Incident branches.	*Reflex motor branches.*	*Excited actions*
III. Glosso-pharyngeal, from base of tongue and membrane of pharynx.	The pharyngeal plexus of the Pneumo-gastric.	Associated movements of tongue and pharynx in deglutition.
IV. Posterior spinal from *a.* The general surface.	The spinal accessory.	Movements of muscles of respiration.
b. The glans penis and clitoridis.	Diaphragmatic, Intercostal, Abdominal, } from the spinal.	Expulsion of fæces, urine, and semen; and of the fœtus.
c. The anus. *d.* The cervix vesicæ. *e.* The cervix uteri.	The sphincters, expulsors, ejaculators, Fallopian tubes, uterus, &c. } from the sacral.	Retentive movements of sphincters—of the cardia, of the valvula coli? of the anus, bladder, neck of uterus? and vesiculæ seminales?

Tone and irritability of the muscular system.

This table is compiled from data contained in Marshall Hall's work 'On the Diseases and Derangements of the Nervous System,' the excited actions being placed opposite to those divisions of the first two columns with which they are most obviously connected. The excited actions in the third column are not produced by irritation of the incident nerves of the first, but correspond more closely with the action of the reflex motor branches of the second. Thus, the incident excitor branches of the nostrils, when irritated, give rise not merely to the facial respiratory movements, but also to violent action of the muscles of respiration; and irritation of the bronchial incident nerves excites not only the muscular fibres of the bronchial tubes, but the muscles of expiration also, to the act of coughing.

441. The following table presents the pathology of the true spinal system; also in accordance with the views of Marshall Hall:—

PATHOLOGY OF THE TRUE SPINAL SYSTEM.

Diseases of the Incident Nerves.

I. Dental, Gastric, and Intestinal Irritation in Infants.	1. Crowing inspiration. 2. Strabismus, spasm of fingers and toes, strangury, tenesmus, &c. 3. Convulsions. 4. Paralysis.
II. Gastric, Intestinal, and Uterine Irritation in Adults.	1. Hysteria. 2. Asthma. 3. Vomiting, hiccough, &c. 4. Epilepsy. 5. Puerperal convulsions, &c.
III. Irritation of textures supplied with nerves of common sensation.	1. Traumatic tetanus. 2. Hydrophobia, &c.

Diseases of the Reflex or Motor Nerves.

I. SPASM.	II. PARALYSIS.
a. Spasmodic tic. *b.* Torticollis. *c.* Contracted limbs, &c.	

Diseases of the Spinal Marrow itself.

I. Inflammation and other diseases.
II. Diseases of the vertebræ and membranes.
III. Counter Pressure, &c., in diseases within the cranium.
IV. Centric epilepsy, tetanus, &c.
V. Convulsions from loss of blood, &c.

442. As we have seen, the condition of the nervous system and that of other functions of the body reciprocally affect each other; but this mutual dependence is so strikingly displayed in the case of the circulation as to merit further consideration.

443. The effect of the emotions and passions, and of all violent exertions of the body, on the heart, is a matter of daily observation; and so surely does the circulation participate in every change of the nervous system that it becomes the best test of its degree and amount. Every violent exertion of different muscles, and every long-continued exercise of the same muscles, strongly excites the pulse; and rest not only restores the number which it had before the effort, but for a time still further reduces it. The various causes of excitement to which we are exposed during our waking hours affect the circulation in the same way; and it is the fatigue thus produced that causes the pulse to fall towards evening, to regain its frequency when the body has been refreshed by sleep. Precisely the same effects are produced by disease. Thus, in febrile affections the pulse during the height of the disorder is much more frequent than in health, but during convalescence the pulse falls many beats below its natural frequency, to regain it as health and strength return.

444. Another remarkable fact established by careful observation of the pulse is, that it is much more affected by all causes of excitement when we are in full possession of our strength, than when exhausted by fatigue. Thus all stimuli—muscular exertion, food, drink, and even mental application—have a much greater and more enduring effect on the circulation in the morning than at night.

445. But there are states of debility in which the heart's action is more frequent than in health. This occurs in an advanced stage of convalescence, when the patient begins to recover strength, and also in the decline of febrile affections, so long as any degree of fever continues. A greater degree of debility in the absence of actual disease is characterised by a very small and very frequent pulse; but such debility is rare, except as the consequence of diminution in the quantity of the blood, whether from hæmorrhage or from excessive discharges.

446. When nervous exhaustion is accompanied by local disease, whether functional or structural, that state of system exists to which we give the name of *irritation*. It occurs in slow convalescence from fever, when some local affection supervenes; as an immediate consequence of severe injuries in subjects weakened by disease or bad habits of life; and as a more remote consequence in sound constitutions, the injury itself producing in these the same nervous exhaustion which bad habits or previous disease had occasioned in those.

447. Another example of the action of the nervous system on the circulation is afforded by that temporary arrest of the heart's action known as *syncope*, or fainting, brought about, as it may be, either by violent shocks, originating from without, as in accidents, or from within, as in violent emotions. Sometimes the heart is paralysed by the shock, and death results.

448. The movements of the heart partly depend on the pneumogastric nerve; hence, when the functions of the centre in which this nerve originates are interfered with by cerebral effusions, by injury of the medulla oblongata, or by the circulation of impure blood, the force and number of the heart's contractions are diminished.

449. The effect produced on the nervous centres by changes in the circulation is more important even than those which the circulation suffers by alterations in the state of the nervous system. The exhaustion which follows strong nervous excitement has its counterpart in that produced by loss of blood, which causes syncope or death, partly by depriving the heart of its stimulus, and partly by paralysing the nervous centres.

450. In healthy persons loss of blood occasions debility proportioned to the quantity lost; but in persons afflicted with local disease, or of a broken constitution, the debility reinforced by nervous excitement becomes *irritation*. The same effect follows when the quantity of the circulating fluid is diminished by profuse discharges, such as leucorrhœa or diarrhœa, or by the excessive and continued drain of natural secretions, as in menorrhagia, and in prolonged suckling. But the puerperal state, combining, as it does, nervous exhaustion, loss of blood, a local affection, and a sudden change of the equilibrium of the fluids, presents the most vivid picture of this state of irritation.

451. In this condition of irritation, as in that originating in the nervous centres themselves, the circulation is affected, and we have the frequent quick pulse easily excited by mental emotion or by strong and sudden impressions on the organs of sense. The functions of the brain also suffer; and we have, according to the degree of irritation, mental excitement, delirium, or mania. The nervous influence conveyed to the muscular system betrays the same derangement by restlessness, jactitation, convulsions, and spasms in the voluntary muscles, and frequent or irregular breathing, laughing, crying, sighing, sobbing, and yawning, in those of respiration. The nerves of sensation also participate in the general derangement, and we have intolerance of light and sound, excessive sensibility of surface, and acute reflected pains in the walls of the chest and abdomen. The stomach likewise shows its sympathy with the nervous centres by nausea, vomiting, or hiccough.

452. Such are the phenomena of the state of irritation, whether originating in the nervous system, or in the circulation. It is a state aggravated by depletion, but relieved by remedies that impart strength while they soothe excitement. A combination of narcotics and tonics, or, if the debility is extreme and the nervous symptoms urgent, of narcotics and stimulants, is the remedy indicated.

453. The influence of the nervous system over muscular movements has already been alluded to, and two classes of movements have been described, the involuntary and the voluntary; the former excited by changes in the condition of the incident or excitor nerves entailing corresponding changes in the reflex or motor nerves, and the latter by the will. In disease, or in peculiar states of system, the one set of muscles takes on the character of the other, the involuntary muscles obeying voluntary impulses, and the voluntary muscles performing involuntary contractions.

454. A well-authenticated example of involuntary muscle being subject to the will occurred in the case of a Colonel Townsend, who possessed the strange faculty of stopping the beat of his heart at will. The same power seems to have existed in one or two other instances.

455. The most striking examples of involuntary actions of voluntary muscles observed in disease are, chorea, hysteria, epilepsy, catalepsy, convulsions, tetanus, hydrophobia. Of these diseases some depend on the direct influence of the nervous centres, but the greater part are examples of a reflex action.

456. When the contractions continue in the same muscles for a certain space of time, producing a state of continuous rigidity, they are said to be *tonic;* when the muscles are alternately contracted and relaxed, they are called *clonic*. Tetanus, hydrophobia, and catalepsy are examples of *tonic* spasm; chorea, hysteria, epilepsy, and convulsions (unless the term is qualified by such words as *rigid* or *tetanic*) are cases of *clonic* spasm.

457. In chorea and hysteria, voluntary and involuntary impulses are strangely blended; but the will exercises a different degree of control in the two cases. When the patient in chorea wills a movement, the involuntary action, mixing with the voluntary effort, causes grotesque distortions, which attempts at restraint only increase; but the movements of the hysteric patient are less grotesque, though more violent, and can often be restrained by a strong effort of the will.

458. Convulsions are examples of unmixed involuntary contraction, commonly due to reflex action; but when they follow the loss of blood, they probably arise from the sudden removal of that nervous influence which maintains the tone and equilibrium of the muscles. Hence the flexors, which are the stronger muscles, contract, and the extensors, being put on the stretch, are in their turn brought into action, and thus an alternate or clonic contraction of the two sets of muscles takes place; but the flexors at length overpower the extensors, and if death ensue, the fingers and toes are found flexed.

459. Convulsions, then, are often the last movements of a living body. They are also most efficient means of recovery, for when the circulation has nearly ceased, and the heart does not receive blood enough to excite it to action, the contraction of the muscles of the limbs forces the venous blood towards the heart, and thus tends to re-establish the

circulation. The trembling of the limbs from cold (a low degree of convulsion) has the same beneficial effect in restoring the circulation.

460. The nerves of sensation, like those of voluntary motion, are subject to various derangements. Sensation may be lost (anæsthesia), or exalted (hyperæsthesia), or perverted (noseræsthesia). The loss of sensation which sometimes accompanies palsy is an example of anæsthesia affecting the nerves of touch; and amaurosis, of anæsthesia of the optic nerve. Intolerance of light and sound, and violent hunger and thirst, are examples of hyperæsthesia. The strange pains and anomalous sensations of hysteria and hypochondriasis, are instances of noseræsthesia. In some hysteric females there seems to be diminished sensibility of the nerves of touch, with increased sensibility of other nerves, the sensibility appearing to be withdrawn from the one to be concentrated in the other. Hence some of the strongest phenomena of nervous affections, including those induced by the manipulations of the mesmeriser.

461. There still remain to be considered two functions closely dependent upon the nerves, though connected more or less with the changes which are constantly taking place in the fluids and textures of the frame:—the generation of heat and electricity.

462. *Animal Heat.*—The cause of animal heat is still a subject of controversy; but the experiments of Depretz and Dulong, as interpreted by Liebig, have rendered it highly probable that animal heat is entirely due to the combination of the carbon and hydrogen of the blood with the oxygen of the air. This combination, formerly supposed to take place in the lungs, is now believed to occur in the minute structures of every part of the system by means of the oxygen absorbed in exchange for the carbonic acid expelled from the lungs. It has also been shown experimentally that the nerves influence the temperature of the body. Though the precise effect of each of these causes in the production of animal heat has not yet been determined, observation has shown that its amount varies greatly in different states of the system.

463. The temperature of those internal parts which are most accessible—viz., the mouth and rectum—is about 97½° or 98½° Fahr. That of the external parts is somewhat lower, and it has been observed to differ in parts near to and remote from the centre of the circulation; thus, Dr. J. Davy observed, that the temperature of the axilla being 98° F., that of the loins was 96½°, that of the thigh 94°, that of the leg 93° to 91°, and that of the sole of the foot 90°. The temperature of the blood was about 101°.

464. In disease remarkable deviations from the standard temperature have been observed, both in excess and in defect. In inflamed parts it has been found as high as 105° or 107°, and the heat of the whole surface has reached the same degree in some cases of fever, and risen still higher (to 112°) in scarlatina. On the other hand, in morbus cæruleus and in the cholera, the temperature has been observed as low as 77½° or 77°.

465. In most diseases the temperature bears a pretty exact proportion to the pulse; but remarkable exceptions to this rule have been observed, and notably in cases of fever. Thus, in fever a pulse of 45 has coincided with a temperature of 105°; and in hydrocephalus a pulse of 60 or 70, with a temperature of 100°.

466. *Electricity.*—The facts ascertained with regard to free electricity in man are the following:—As a general rule the electricity is positive, but in the female more frequently negative than in the male; it is more abundant in persons of a sanguine than in those of a lymphatic temperament; greater in the evening than in the morning; greater when the temperature of the body is high than when it is low: it is increased by spirituous liquors, and reduced to zero in rheumatic affections. The free electricity of the body is generally of very feeble intensity; but in peculiar states of system sparks have been given out in great abundance. There exists in the nerves of all animals, independent of all mechanical and chemical actions in the body or external to it, a natural electricity, circulating in closed currents from the central parts of the nerve fibres which are in a − condition, to the surface which is in a + state. There is, in fact, an electrical antagonism between the transverse and vertical sections of the nerve. The same phenomena are presented in muscular fibres, but they are no doubt due to the nerves contained within them.

5. MENTAL PHYSIOLOGY AND PATHOLOGY.

467. Some of the most difficult and responsible duties which the physician is called on to perform have relation to the mind. Mental disorders more or less permanent, and more or less dependent on bodily diseases, are of common occurrence in the practice of all physicians; and they engage the exclusive attention of a considerable body of medical practitioners. Hence the physiology and pathology of the mind have claims on the attention of the medical man second only to those advanced by the physiology and pathology of the material structures.

468. Indeed the brain, the mind's instrument, built up and nourished as other structures are, deriving its supply of blood from the same centre, through the same intricate network of arteries and veins, is affected by every change in the composition of the blood, and in the balance of the circulation; and is subject to like functional and structural diseases with other organs of the body.

469. The brain and nervous system, as parts of the material fabric of the body, must also be subject to all the influences, external and internal, already examined (§§ 4 to 88). Between brain and brain, as between body and body, it is reasonable to expect important original and acquired differences: original differences in size, shape and consistency, and others more difficult to define, resulting from temperament, diathesis, and idiosyncrasy, from age, sex, and race; and acquired differences, due to climate, residence in town or country, education, occupation, and habits of life.

470. Many of these physical agents act on the brain and nervous system more promptly and forcibly than on any other part of the body. This is especially true of excitement, fatigue, dissipation, intemperance, and inaction. Many poisonous agents, too, take effect chiefly on the brain and nervous system, and prove fatal by the functional disturbance to which they give rise.

471. Again, the brain, as the mind's material instrument, is subject to inaction, to wholesome exercise, or to over-exertion, according as education is neglected or enforced in early life, and in proportion to the necessity which exists for self-culture and labour in after life.

472. If, then, we consider the brain from this twofold point of view (as a constituent part of the body, subject to all the influences by which it is affected, and as the material organ of the mind developed by mental exercise), we shall be prepared to find the differences between mind and mind, in health and disease, equalling and even surpassing those already pointed out (§ 88) as existing between body and body.

473. The brain, as already stated (§ 408), is the centre both of intelligence and of action, to which all sensations are referred, and from which all volitions emanate. It performs these functions subject to the condition that the nervous communication in both directions (inwards from the organ of sense, and outwards to the muscles) shall be unbroken.

474. Each organ of sense consists of three parts: 1, an external apparatus on which the impression of the object is made by contact, as in the senses of touch, taste, and smell, or by intermediate undulations or vibrations, as in the senses of sight and hearing; 2, a nerve transmitting this impression to the brain; and, 3, a portion of the brain itself set apart, as is probable, for taking cognizance of the impression thus produced and conveyed; and (as in the case of the two eyes) combining two distinct impressions into a single sensation. Each distinct apparatus of volition, such as the organs of speech and of locomotion, consists, in all probability, of similar constituent parts; 1, of a portion of brain in which the act of volition originates; 2, of a nerve or nerves by which the mandate is conveyed; and, 3, of a group of muscles by which the mandate thus originated and thus transmitted is obeyed.

475. The parts of the brain to which the several sensations are conveyed, and from which the mandates of the will issue, are subject both to original deficiency and to the disabling effects of disease. Some persons, for instance, are unable to distinguish colours, others to recognise musical notes and intervals; and, on the other hand, a few, with perfect hearing and well-formed organs of speech, have never been able to articulate. Blindness from disease of the parts of the brain to which the optic nerves join themselves, and loss of speech from apoplexy affecting the base near the origin of the lingual nerves, are familiar examples of the disabling consequences of disease.

476. In tracing the path of sensation from without to within—from the impression on the organ of sense to the part of the brain that takes

cognizance of it—we come in contact, so to speak, with two important operations, or faculties, of the mind, *volition* and *memory*.

477. Volition plays an important part, not merely in directing all those muscular movements by which we provide for our subsistence and communicate with our fellows, but also in perfecting the work of sensation begun by the organs of sense. Without that act of volition, which, when brought to bear on our sensations, constitutes *attention*, no external object could be either distinctly perceived, or recollected. On the other hand, without that power of reproducing sensations which constitutes *memory*, the more complicated acts of volition could have no existence. Hence, volition and memory would appear to be closely linked together, to have their material instruments nearly connected in certain parts of the brain, and to be subject to be simultaneously impaired by disease. But the will and memory are not limited in their operations to muscular movements and bodily sensations; for the will also directs and controls the operations of the mind, and the memory stores up and reproduces not sensations only, but trains of thought, processes of reasoning, complicated transactions, and the workings of emotion and passion.

478. It has just been stated that impressions made on the senses, in order that the mind may take cognizance of them, must be accompanied by an act of volition known as *attention*. Now, whenever an object of sense is also an object of attention, it is said to be perceived; in other words, sensation becomes *perception*.

479. Perceptions vary greatly in intensity in different persons, at different ages, and in different states of body; and the same difference exists in regard to that reproduction of perceptions which constitutes memory or recollection. In some persons, perceptions are reproduced with extraordinary quickness, vividness, and fidelity, while in others they can scarcely be reproduced at all; and one of the principal features of the mind in old age, and of the unsoundness of mind peculiar to the aged, consists in the obtuseness of the perceptions, and the extraordinary difficulty with which they are recalled or reproduced. Perception and memory, indeed, bear a pretty exact relation the one to the other. The objects best perceived are best remembered, and those that made scarcely any impression on the senses are not reproduced at all, or with great indistinctness.

480. In a few individuals, perceptions are reproduced with such vividness and fidelity that objects formerly perceived, are, so to speak, painted on the retina, or transferred to the other organs of sense by an effort from within. This perfect operation of memory, this power of depicting objects on the retina by the force of thought, is sometimes attributed to the imagination, and is termed *conception*. The poet Goethe had it during the whole of his life; and in a few instances, the same power is retained during childhood.

481. When this transference of thought to the organ of sense is involuntary, it constitutes *illusion*, of which the most familiar form is *spectral illusion*.

482. Objects of sense, then, make impressions which vary in intensity with the degree of attention bestowed upon them. When the mind is preoccupied by thought, objects presented to the senses make little or no impression, and are neither observed nor remembered; and this preoccupation, or *absence of mind*, explains the eccentric acts of *absent* men, and some of the unaccountable proceedings of madmen.

483. By that effort of the will, then, which we call *attention*, we are able to perceive objects with more distinctness, and to reproduce perceptions with more facility. Now, sensations do not come into the mind singly, but in groups; and our knowledge and experience of the objects that surround us are compounded of many sensations. Thus, an orange produces a sensation of size, of shape, of colour, of weight, of odour, of taste; and it is by an effort of the *will* alone, in other words, by an effort of *attention*, that we single out one of these sensations which the word orange represents, and make it a separate subject of contemplation. This separation of one sensation from another is called *abstraction*, and the exercise of the mind upon sensations thus separated is called *abstract reasoning*.

484. This power of abstraction is the more necessary as it is needed to control and correct a directly opposite faculty, or mode of action, of the mind—the faculty of *association*. As attention separates and isolates sensations which are commonly combined, so does *association* combine, and cause to reappear together, or in rapid succession, those sensations or ideas which either took place simultaneously or successively, or which have in any way been previously conjoined.

485. This tendency of sensations and ideas to reappear in the connection or succession in which they had previously entered the mind, can be broken through only by an effort of the will; but when such effort has repeatedly placed in combination or succession a number of sensations or ideas, this very combination or succession, though originally forced and voluntary, soon submits to the law of *association*, and a fresh effort is necessary to separate and disarrange them.

486. That repetition of sensations, thoughts, or movements, at first distinct, difficult, and voluntary, which at last transfers them from the dominion of attention to that of association, is called *habit*, of which, when this transference is complete, a man is said to become the slave.

487. By a faculty allied to, if not identical with, this of association, the mind also passes from one thought or recollection of an agreeable or of a painful character, to another of the same complexion.

488. Attention directed to different sensations or ideas in alternation or succession implies a faculty of *comparison*; which faculty, in a being possessed of free will, implies also a power of choice.

489. This faculty of comparison is essential to the acquisition of knowledge, as well as to the regulation of our actions. The impressions made on one sense must be compared with those made on another, the

eye must correct the ear, and the sense of touch the eye, in order that we may form distinct and precise notions of the properties of external objects. The sensations or ideas reproduced by the memory must also be contrasted with those caused by objects present to the senses. In the unsound mind, this power of comparison is lost, and intrusive memories or passing fancies are taken for realities.

490. Without the exercise of this faculty of comparison it would be impossible to make a single step in art or science. Orderly arrangement and scientific classification are wholly dependent upon it.

491. The objects grouped by the aid of this faculty are either the same or similar; that is to say, all their properties agree or only some. Hence, we are able to say of any one object contained in a group or clas what we are able to say of every other, either in respect of all its properties, or of that one property which formed the basis of the classification. Now this twofold process of constructing groups of individuals and then affirming of the individuals that they possess the property o properties which first led to their being thrown into groups, is the secre of all our knowledge—of science in its highest and in its lowest forms.

492. When the objects thus grouped are simple in themselves an exactly alike, and when the words used to describe or define them ca be understood only in one sense, our knowledge is absolutely certain but when they are complex and only similar, and our words less precise we are obliged to content ourselves with knowledge less definite an exact. Now, there is only one class of objects to which the first part o this description applies, and these objects are mere *abstractions*; that i to say, they consist of the universal relations, as distinct from the specia properties, of matter, such as space, time, number, position. direction with regard to which we can make assertions that can neither be doubte nor denied, and definitions that cannot be misunderstood: and *Reaso* availing herself of these *assertions* or *axioms*, and of these plain defin tions, and using a language at once condensed and intelligible, has bui up that vast and wonderful fabric of abstract knowledge known as th *mathematics*.

493. Every comparison of one object with another, or of one obje with the group to which it belongs, results in an inference expressed understood; and these acts of comparison, with the inference draw from them, constitute a process of *reasoning*. So that *reason* may defined as the faculty by which we draw inferences from comparisons.

494. Now every process of reasoning, however complicated it ma seem, consists of two assertions, containing the elements of a compariso and an inference. The first assertion is, that a *group* of objects possess this or that *property* or *properties*; the second, that an *individu* object belongs to that group; and the inference is, that, as a necessa and inevitable consequence, this individual has the properties of t group to which it is asserted to belong. These two assertions are tec nically called *premisses* (major and minor), and these, with the concl sion or inference, constitute the *syllogism* of the logician.

495. It is of the first importance to understand that when fallacies creep into a process of reasoning, they are to be found in the premisses, from which the inference, or conclusion, is a necessary consequence: and this observation applies to the operations of the unsound, as well as of the sound mind. For there are forms of unsound mind in which the power of making just comparisons and drawing correct inferences is retained; the defective reasoning consisting in erroneous premisses dictated by distorted perceptions, a perverted imagination, or over-excited feelings.

496. In cases of monomania, or partial intellectual mania, when the patient believes that his food is poisoned, or that his body has been changed from flesh and blood into glass or butter, this power of drawing just inferences from false principles is seen in action; for such a patient will not merely reason correctly on the false and incredible assumption, but he will shape some at least of his actions in obedience to the inference correctly drawn from the false premiss.

497. There are, however, other forms of mental unsoundness in which the reasoning faculty is so impaired, that even the formation of a simple syllogism is impossible. This happens in extreme cases of *dementia* and in the *dementia* of old age. Again, there are cases of *idiocy*, or of extreme *imbecility*, in which the reasoning faculty has never been developed, even to the extent of comprehending or employing the simplest and easiest arguments. There is also a condition of the unsound mind, characterised by complete *incoherence*, when all the faculties are in a state of intense excitement and hurry, so that there is not, so to speak, breathing-time for the deliberate exercise of thought or reflection.

498. Some account has now been given of those organs and faculties by which we obtain knowledge; of the *senses* as its prime source; of *sensations*, as the impress of outward objects on the sensorium; of *perceptions*, as sensations recognised and strengthened by attention; of *conception*, as sensations without corresponding outward objects, reproduced by the intense operation of the mind itself; of *memory*, as the faculty by which sensations are less distinctly reproduced; of *attention*, as that by which sensations are strengthened, separated, or arbitrarily combined; of *association*, as the faculty by which sensations are linked together in their original or acquired relations; of *comparison*, as that by which sensations or ideas are contrasted; and, lastly, of *reason*, as the faculty by which conclusions or inferences are drawn from premisses.

499. By the aid of these faculties alone we might have accumulated knowledge, and created arts and sciences; have obtained much acquaintance with the properties of matter, and some mastery over it; and we might have made some advances in civilization. But without that inventive, suggestive, anticipating, exaggerating faculty which we call *imagination* or *fancy*, hypothesis, theory, poetry, and high art would have been impossible, and several forms of unsound intellect unknown.

500. The province of this faculty would seem to be to select and arrange, in new and arbitrary combinations, forms, colours, sounds, de-

scriptive words and phrases, and even the simplest and most abstrac facts of science, with a view to please, persuade, and amuse; or, t speak more generally, to excite in the minds of others, by every kind o skilful combination and contrast, emotions pleasurable or painful. Th most arbitrary of these combinations, when relating to matters o science, are termed hypotheses; when employed upon trivial subjects and directed to mere amusement, they are known as wit and humour For practical purposes it may suffice to state that men exercise the imagination, or fancy, whenever, without intention to deceive, they mak assertions incapable of proof, or unsupported by the concurrent testimon of other persons having the same opportunities of observation or experience with themselves.

501. Of the intellectual faculties, the imagination is that which ha the strongest affinity with the emotions and passions, for its operation like theirs, are attended by excitement. It seems, indeed, to hold middle place between the intellect and the passions; adding vigour an originality to thought, while it lends attraction to objects of desire, an gives intensity to every effort by which they can be compassed.

502. The powers or faculties of sensation, perception, conceptio comparison, reasoning, and imagination, make up the sum of what ar commonly known as the intellectual faculties. They may all be said t be dependent, primarily, on the senses, and to subserve the work of contemplation; but the faculties now to be considered lead direct to actio They are known as *passions* and *emotions,* as active and passive emotion or as propensities and sentiments.

503. Between emotions and passions it is not easy to draw an exa line of demarcation; but it is usual to characterise *benevolence*, *veneration*, *hope*, *fear*, *grief*, *remorse*, as emotions; *lust*, *anger*, *ambitio* *vanity*, as passions. Although there is undoubtedly a distinction betwee them, yet they resemble each other in this—that they arise in the min spontaneously whenever the object calculated to excite them is present to it, whether from without by the *senses*, or from within by the *memor* They do not arise from any process of *reasoning*, or from any exercise comparison, but resemble instincts in the rapidity with which they sprin up, the certainty with which they are directed to their objects, and th promptitude with which they act. When very strongly developed, excited, they act even in persons of sound mind so quickly as to forest the exercise of reason. Indeed *reason*, in the sense of the *reasonin* *faculty*, is in the very nature of things too slow in its movements form an efficient check to passion, or a safe guide to emotion. To chec the one and regulate the other is the work of *conscience*, an original a innate faculty, but one in some degree formed and moulded by instru tion communicated in early life, and modified by the habits of societ Acting with all the quickness and precision of an instinct, it is the on faculty prepared to offer effectual resistance to the feelings and passion

504. As the intellectual faculties exist both originally, and as a co sequence of habit and culture, in very different proportions in differe

ersons. so also do the *emotions* and *passions;* and just as education ives acuteness to the perceptive and reasoning faculties, indulgence gives ower to the emotions and passions, and restraint, on grounds of reason nd right, supremacy to the conscience.

505. This sketch of the mind in its sound state would be incomplete some allusion were not made to those first truths in which all sane ien believe, without any conscious operation of the intellect. These are belief in our own personal identity ; in the real existence of objects of ense ; in the uniformity of the operations of nature ; and in the neces- ry connection of cause and effect.

506. Having thus briefly considered the faculties by which we gain nd impart knowledge, the emotions and passions which move us to tion, the conscience which counsels and restrains, and the first truths ithout a belief in which life itself could scarcely be preserved ; our ttention will naturally be directed, in the next place, to certain states f the senses and of the mind, which, while they do not constitute mental nsoundness, often enter into that state as constituent parts, and serve to row valuable light upon it.

507. The first of these conditions is *illusion* of the senses, among hich *spectral illusions* are the most interesting.

508. All the senses, without exception, may become the seats of ab- ormal impressions—the eye of bright or dark spots, and circles of lours ; the ear of humming, hissing, or blowing sounds, or distinct usical notes ; the taste, of bitter, salt, or sour savours ; the sense of nell, of unreal odours ; and the sense of touch, of a feeling of local ressure. of heat or cold, of creeping, itching, pricking, and tingling. hese false sensations are due to changes in the circulation through the rain, or through the nerve of sense.

509. Objects of sense are also apt to be exaggerated, or the reverse, y peculiar states of the organs of sense, or of the brain ; and especially uring slight febrile attacks, or in the early stage of convalescence from brile disorders. Visible objects grow to enormous dimensions, or windle to the smallest size ; and sounds seem lower or louder than ey really are.

510. Similar exaggerations often take place under the influence of rong mental emotion, especially fear. Good examples of this sort are upplied by two cases of theft. A stick of a certain length was given to number of suspected persons with the assurance that the stick of the hief would grow by supernatural power. The culprit, imagining that is stick had actually increased in length, broke a piece off, and was thus etected. A farmer detected depredations on his corn-bin, by calling his ien together, and making them mix up a quantity of feathers in a sieve, ssuring them that the feathers would infallibly stick to the hair of the hief. After a short time one of the men raised his hand repeatedly to is head, and thus betrayed himself.

511. Another affection of the organs of sense allied to true spectral illusions, consists in an extraordinary permanence of impressions. One instance in which the notes of a bugle remained on the ear for nine months is mentioned by Abercrombie; and another, in which the spectrum of the sun remained on the retina for ten years, is cited by Feuchtersleben from Boyle.

512. Impressions made on the senses have also been reproduced with great exactness after an interval of time. When Dr. Ferrier was about fourteen years of age an interesting scene which he had witnessed during the day was reproduced with great fidelity, on entering a dark room, and continued visible for some minutes. In this instance the reproduction seems to have been involuntary; but Goethe could produce pictures at will, though unable to dismiss them when he desired to do so.

513. From pictures on the retina, conjured up by an effort of the will, without corresponding object present to the eye, and from similar pictures produced without effort through vivid impressions previously made, the transition is easy and natural to those illusions of the senses, and especially of the sense of sight, over which the individual affected by them has no control, and which have also no relation to objects previously perceived. Such illusions are of special interest, inasmuch as, though quite compatible with perfect sanity, they are very common in cases of unsound mind.

514. Several interesting cases of ocular spectra, so closely resembling real objects as to be distinguished only by the most careful exercise of comparison and judgment, are recorded in Sir David Brewster's "Natural Magic," and Sir Walter Scott's "Demonology and Witchcraft." A lady, whose case is related by Sir David Brewster, had the sense of hearing first affected, her husband seeming to speak to her, though not near her. Illusions of the sense of sight followed. She saw spectres of her husband; of a near relation in a shroud; of a deceased friend; and of a spectral cat. But whether the illusion was of the ear or the eye, the mind was quite aware of the real seat and nature of the deception.

515. The woman in the red cloak, seen by Mr. Abernethy's patient the ghastly spectre which appeared to Lord Castlereagh at night, and the figurantes in green who drove Sir Walter Scott's young man of fortune out of England, all belong to this class.

516. Many remarkable men have been subject to these false impressions. The list comprises the names of Luther, Oliver Cromwell Pascal, Goethe, Cellini, and Swedenborg. The student worn out by application, the religious enthusiast exhausted by watching and fasting Silvio Pellico in his solitary confinement, the sailors of the 'Medusa suffering from mingled privation and excitement, the drunkard and the opium-eater, and persons under the influence of poisons of the narcotico-acrid class, have all afforded examples of spectral illusion.

517. Spectral illusions, too, are not rare in females at or about the change of life, when suffering from the group of nervous symptoms so

common at that period (*mimosis inquieta*). In either sex, they may occur at any age from 4 to 80.

518. Lastly, spectral illusions are common in dreams, in delirium, and in madness; so common are they in this last condition, that Esquirol estimates at 80 per cent. the proportion of persons so afflicted, who are subject to illusions of one or other of the senses.

519. Though illusions of the senses occur in persons both of sound and of unsound mind, they differ in this, that the madman believes in their reality, while the sane man soon learns their true character by the use of the other senses, or by some other effort of comparison. There are, indeed, two ways in which these false perceptions may be corrected: 1, by confronting them with some real sensation, as in a case mentioned by Abercrombie, in which the lock of a door was seen through the spectral figure; and 2, by a comparison with the perceptions of other persons, as in Mr. Abernethy's case of the woman in red. A blind patient of the Editor, though in no danger of misunderstanding the real nature of his illusions, was always struck with the circumstance that his figures moved about quite silently. The man of unsound mind neglects all these means of undeceiving himself, or is unable to use them; or, if he entertain any doubt, he has some false reason to assign in favour of the reality of the supposed object of sense. A religious maniac, for instance, will think it impious to doubt.

520. Spectral illusions can sometimes be traced to thoughts or wishes which had previously passed through the mind. A patient of the Editor, recovering from a slight attack of fever, preceded by a severe family affliction, slept, during the heat of summer, in a room commanding a view of a large pond. One day he was seized with a great desire to bathe, and on the evening of that day a spectre appeared at his bedside, drew aside the curtains, and invited him to the water. This fact is rendered the more interesting by the circumstance, that though the patient's mind was so far recovered as to allow of his reasoning calmly upon the occurrence, his mood of mind and expression of countenance changed in an instant, and he affirmed with great energy his determination to accompany the spectre should it appear to him again. A similar illustration of the occasional dependence of spectral illusions on the natural workings of the mind was afforded by an old lady, also a patient of the Editor, who, on two occasions, under the apprehension of the fatal issue of severe attacks of illness in her children, saw the whole paraphernalia of a funeral cross her room.

521. In some forms of unsound mind, especially in that known as *incoherence*, it is probable that illusions succeed each other with a rapidity only to be compared with the hurry of the thoughts to which the patient gives utterance.

522. Considerations of great interest and practical importance connect themselves with spectral illusions.—1. They are independent of the will; for they form the very staple of dreams in which the will is suspended,

and they appear to the waking man not merely without the will but in spite of it. 2. They are sometimes the false impressions of dreams continued in the waking state. 3. They are not merely vivid reproductions of former impressions on the senses, but new combinations and creations. 4. They often occur in persons in no way remarkable for talent or imagination. 5. They are often dependent on such changes in the balance of the cerebral circulation as occur in sleep, or in comparatively trivial departures from health. In Nicolai, they were clearly traced to the suppression of a hæmorrhoidal discharge, and the immediate excitement of a fit of passion. 6. They are not what it would not be unreasonable to suppose them to be, mere reflex impressions on the retina, originating in the brain, and conveyed back through the optic nerve; for they occur in blind persons, and in cases in which the optic nerve has been found so injured or diseased as to be unable to perform its proper function.

523. The bearing of these facts on the phenomena of unsound mind is obvious. If a change in that part of the brain by which impressions on the senses are perceived, or of the whole brain, can conjure up illusions of the senses so like realities as to require a strong effort of the sound mind to distinguish them, it is reasonable to suppose that those parts of the brain which bear to thought, emotion, and passion, the same relation as these perceiving portions do to sensation, or the entire brain, as the case may be, may undergo such changes as shall generate involuntary imaginations having no foundation in fact, words without meaning, emotions springing from no sufficient cause, and passions admitting of no control.

524. The same impressions on the organs of sense which, when they occur to waking persons, are called illusions, form, as already stated, the very staple of our dreams, which have an air of reality, partly due to the vividness of the impressions, and partly to their not being corrected by the judgment. But this is true, not only of impressions on the senses: it holds good equally of mental operations, which often do not suffer by comparison with similar operations voluntarily and consciously performed in our waking state. It would seem, therefore, that that change in the state of the brain, whatever it be, which in waking persons occasions *illusions* of the senses, gives rise during sleep to every species of mental *delusion*.

525. These two terms, *Illusion* and *Delusion*, are here contrasted and ought not to be confounded. The distinction between them will be understood by the addition of three words to each:—an *illusion* of the senses, a *delusion* of the mind. The word *phantasm* may be used as a synonym of illusion. The term *hallucination*, being sometimes used in the sense of illusion, sometimes of delusion ought to be allowed to fal into disuse. When an illusion of the senses continues to be mistaken fo a real sensation, through inability to distinguish the one from the other it becomes a delusion.

526. *Dreaming* is a state of mind in which illusions of the senses and delusions of the mind arise spontaneously while the senses are closed t

the external world, and every voluntary mental effort is suspended, or very imperfectly exercised.

527. Many dreams have for their exciting cause some bodily sensation, which becomes blended with fanciful accompaniments. A blister applied to the head suggests a dream of being scalped by savages; and a loud noise, a dream of being shot as a deserter. And, wonderful to relate, the sensation which really gives rise to the dream may seem the last link in a chain of events which would have occupied hours, days, or even years. The sensations caused by an oppressed stomach, loaded rectum, or distended bladder, may link themselves in like manner with imaginary scenes more or less appropriate. The most painful of the dreams due to these causes are known as *nightmares.* The oppression at the stomach is converted into a hideous personality, from whose weight and pressure there is no escape; and the uneasy sensations in the rectum or bladder are woven into the texture of a dream, in which the impossibility of obtaining relief plays a prominent part. Excitement of the genital organs also gives rise to a peculiar class of dreams. But these uneasy sensations sometimes occasion dreams which resemble the sensation itself, only in the one particular of being painful or distressing. Thus a painful tumour or diseased hip-joint may give rise to distressing dreams having no reference whatever to the pain or to the part affected.

528. Recent impressions on the senses, or transactions in which the sleeper has been engaged, also stimulate the fancy to the invention of connected histories of unreal occurrences. Thus, a patient of the Editor, suffering from obstinate colic, which had not been relieved by mechanical means, received an encouraging opinion of his case, fell asleep under the influence of opium, and dreamed that his doctor was an engineer to a railway in which he was interested, and had assured him that there were no engineering difficulties that might not be overcome.

529. In many persons of unsound mind the mental operations bear an obvious resemblance to this class of dreams. Real sensations are mixed up, as in dreaming, with unreal accompaniments; and real events passing in the world receive fanciful interpretations, or are forced into unnatural relationship with their own thoughts. Thus a speculating madman who came also under the Editor's notice, when railroads, the Oregon dispute, and the China war, were dividing public attention, wanted to establish a company to run a railroad from Oregon to China.

530. There are many striking illustrations of this analogy between dreaming and madness in the painfully-interesting autobiography of a religious maniac. The cold air which blows upon him as he tries to suffocate himself, in obedience to the spirits that speak within him, becomes the breath of his sisters cooling him, and encouraging him to go through with his task. The familiar sensation of water trickling down the back is converted into the crystal tears of his father, whose venerable countenance he sees bending over him. His head is shaved, and he grieves that he has "received the tonsure of the Roman Catholic priesthood, a mark of the beast." The jets of gas from the fireplace become

the utterance of his father's spirit, attempting to save him, but constantly obliged to return to be purified in hell-fire, from the contamination of his foul thoughts. The lowing of cattle conveys to him articulate sounds and sentences and the chair grating against the wall speaks to him in his father's voice.

531. Another convalescent from religious mania, informed the Editor, that he was in the habit of looking on his keeper at one moment as the Deity, at another as a man like himself; and that he habitually converted his footsteps into articulate words and phrases, and sometimes into commands to strike him. Believing obedience to be his duty, he was surprised and confounded to find his violence resisted.

532. This analogy between dreaming and insanity is also well illustrated by a case mentioned by Dr. Gregory, in which insanity passed, so to speak, into dreaming; the maniac, for a week after his recovery, being harassed during sleep by the tumultuous thoughts, and violent passions, which had agitated him during his illness.

533. Dreams are sometimes accompanied by voluntary acts, and persons talk or walk in their sleep, or even commit acts of fatal violence in their half-waking state, in pursuance of the train of thought by which the mind is occupied.

534. Closely allied to this last-mentioned class of dreams is the state known as *somnambulism*, or *sleep-walking*, of which there are several varieties. In one form, the somnambulist merely goes through, with the precision of an automaton, a succession of acts to which he is accustomed in his waking state; in another, he performs feats, and runs risks in doing them, which he would shudder at were he awake. He walks on the edge of a precipice, or on the top of a lofty building; or he will accomplish some intellectual task which had baffled him when awake.

535. Between this state of somnambulism and some forms of unsound mind there are analogies worth noting. In both there is sometimes a remarkable increase of talent, in both a complete change of character, and in both a distinct and separate affection of the intellect and of the moral faculties—an intellectual and moral somnambulism, an intellectual and moral insanity.

536. As evincing the change of character which sometimes happens during this state, the case of the Carthusian monk may be cited, who, while awake, was remarkable for simplicity, candour, and probity, but walked almost nightly in his sleep a thief, a robber, and a plunderer of the dead; or that of a pious clergyman who, in his fits, would steal and hide whatever he could lay his hands upon, and once even plundered his own church; or the case of the suicidal somnambulist mentioned by Ray, who contrived to escape from his watchers, and was found suspended to a tree by his feet.

537. From dreaming and somnambulism the transition is easy to certain states of mind, due to temporary and transient causes, readily

recognised, and having a close resemblance to certain forms of unsoundness; namely, *delirium*, *delirium tremens*, and *drunkenness*.

538. *Febrile Delirium* is present in many acute diseases, in fever, and in inflammatory affections of the internal viscera; it also follows upon severe injuries, such as burns, wounds, and fractures, and on surgical operations, and it is a common effect of several poisonous substances. There are two forms of febrile delirium. In the one the patient lies prostrate on his bed, utterly helpless, and muttering indistinctly. This form is present in the advanced stage of most cases of typhus and other fevers, and is known as muttering or typhous delirium. The other form occasionally shows itself in the early stage of fever. It is accompanied by great excitement, and often by great display of strength, and its resemblance to mania in some cases, is so close as to lead to the patient being treated as a lunatic. This form is called violent or furious delirium.

539. From the first form of delirium the patient is easily roused, by loud speaking, to short efforts of attention, and to the performance of slight muscular movements, such as protrusion of the tongue; but he soon relapses into his previous state. In some cases the attendants are able to discover that the mind is occupied by a dream in which real personages play a consistent part.

540. That form of delirium known as *Delirium tremens* has some peculiarities worth noting. There are *three* effects of an abuse of spirituous liquors which may be usefully distinguished. The first is the common drinking fit, in which, when the excitement takes the shape of noisy anger, no mischief is done, because there is not power or steadiness enough in the muscles to commit the threatened violence. The second state has all the characters of a maniacal paroxysm, and is brought on in certain persons whenever they indulge to excess. It is a dangerous state of violent incoherence. The third form is that commonly known as *Delirium tremens*. It is sometimes the consequence of long habits of drinking abandoned for a time; but in the inhabitants of large towns, enfeebled by sedentary occupations, overwork, or want of proper nourishment, it may be the immediate consequence of a single debauch.

541. The characteristic symptoms of this state are trembling of the hands and limbs, and sleeplessness, with a pale face and moist skin. Sleeplessness is a constant symptom, and tremor is rarely absent. The patient is restless, anxious, timid, suspicious, and cunning; and fancies himself in a strange place, and under a control from which he is constantly endeavouring to escape; he is harassed and perplexed by spectral illusions, by strange sounds and threatening voices, and he fancies himself surrounded by hideous and loathsome objects, such as toads, serpents, and scorpions. In the midst of all these objects of horror, disgust, and annoyance, his countenance, strange to say, is often calm and composed; he walks about as in a dream, and will charge a bystander with threatening his life in a tone of the most complete indifference, as if it were immaterial whether he fulfilled his threat or not. In other cases, however

the patient's fears and suspicions impel him to acts of violence, and he becomes very dangerous either to himself or others.

542. The important subject of *unsound mind* is one of such extent that only the merest outline of it can be given in this place. There are two kinds of mental unsoundness, the one consisting in imperfect development, generally coinciding with a defective brain, and often with a stunted or deformed frame, dating from birth, or manifesting itself in infancy; the other supervening in later life in persons previously of sound intellect.

543. The first of these forms is termed *Amentia*, and comprises two sub-classes, *Idiocy* and *Imbecility*, between which there is no clear line of demarcation. Both, however, imply an original defect of intellect, and the first a greater defect than the second. The line may be most conveniently drawn by placing on the one side, as Idiots, all those unfortunate persons who, being otherwise of defective intellect, cannot be taught to speak, on the other side, as Imbeciles, those who can. The class of imbeciles would include those whose mental development has been arrested in infancy or early childhood.

544. The idiot, thus defined, is an imperfectly-developed being, with a mere animal existence, obedient to the simplest calls and impulses of nature, incapable of being taught, dependent on others for support, and able, at the best, to utter a few meaningless articulate sounds.

545. Imbeciles, on the other hand, have a certain amount of intelligence, understand what is said to them, and make themselves understood, remember common events, form habits of decency and propriety, and are equal to common household occupations, or to trades easily acquired. The more intelligent can be taught to read, write, and cipher, and to know the use and value of money; and they may even attain to a certain excellence in mechanics, music, and the fine arts; but they cannot acquire the amount of knowledge, or practical skill, or exercise the prudence in the conduct of affairs, or the control over their passions, which are common among persons of their own rank and opportunities. The feeble control which they are able to exercise over their passions, coupled with the imperfect idea they acquire of moral and legal obligations, accounts for the great number of imbeciles found among the criminal population.

546. Imbeciles in the upper ranks of society, being raised above the temptation to crime, make their defect of character felt by every kind of eccentric and irregular conduct, especially by pecuniary extravagance, and by intemperance. Imbeciles among the middle classes furnish their full contingent of fraudulent debtors, swindlers, and forgers.

547. There is, in fact, a moral as well as an intellectual imbecility, counterparts of the moral and intellectual insanity presently to be mentioned; and a general imbecility, combining defective intellectual development with unbridled passions. Striking examples of moral imbecility,

characterised by reckless extravagance, and an utter want of perception of the disgrace and wickedness of habitual debt, are to be found among the most eminent poets and prose writers of England.

548. The crimes of imbeciles are characterised by the same insufficiency of motive, the same folly in execution, and the same futile attempts at concealment, which mark other parts of their conduct.

549. Idiots and imbeciles afflicted with every variety of bodily infirmity and deformity, are to be found in certain unhealthy regions in all parts of the world, but especially in low damp spots, shut out from intercourse with neighbours, and subject to the evil of constant intermarriages. The evil reaches its highest pitch of intensity in deep alpine valleys, where the enlargement of the thyroid gland, known as *goitre*, is superadded to other deformities. The persons so afflicted are called *Cretins*, and their malady is termed *Cretinism.*

550. The second class of unsound states of mind, or those that supervene later in life in persons previously of sound intellect, comprises more sub-classes than the two forms just considered. Among these the one that most resembles idiocy and imbecility is *dementia*, which, as the name implies, consists of a loss of intellect, sudden or gradual: sudden, as when it arises from severe mental shocks or injury to the head; gradual, as when it follows attacks of fever, of inflammation of the brain, or of mania, and when it attends the decay of strength in the aged (*senile dementia*). Sudden attacks of dementia produce a state of mind nearly allied to idiocy, the attention being sometimes rigidly fixed on the train of thought which accompanied the shock; while those which come on gradually (attended, as they often are, by epileptic seizures, and slowly-increasing paralysis) resemble more closely the different degrees of imbecility. Indeed, many cases which receive the name of dementia are cases of imbecility, not recognised as such till the capacity comes to be tested and strained by affairs of difficulty, or till some mental shock developes more completely the weak points of the character.

551. In this class of cases it is often easy to trace the leading feature of the unsoundness, like a thread, through the whole history of the patient. An habitual debtor at school becomes an extravagant youth, and an embarrassed man; as an incipient madman he thinks he has a divine mission involving a large outlay of money, and he dies in the full conviction that he is the Saviour of mankind.

552. The remaining forms of unsound mind are comprised under the general term *mania*, which also consists of several sub-classes. Those commonly recognised are *general mania*, involving the intellect, passions, and emotions; *intellectual mania*, involving the intellect chiefly, if not exclusively; and *moral mania*, involving the moral nature to the exclusion of the intellect. There is another term in common use, especially in courts of law, namely, *lunacy*. It is sometimes wrongly used as a synonym of mania, and serves to remind us of a class of cases in which there are intervals of sanity and freedom from excitement. The more correct term for such cases is *mania with lucid intervals.*

553. Mania, whatever form it assumes, sometimes comes on suddenly as the result of mental shocks, intense mental excitement, severe injury to the brain, intoxication, or the sun-stroke; but more frequently it makes its approaches gradually during a period often of several years' duration, known as the period of *incubation.* This period is one of painful consciousness to the patient, and of fearful misgivings or mischievous misunderstandings to the friends. The bodily health suffers with the mind, and the disease assumes its full dimensions under the influence of some temporary excitement or disappointment.

554. *General mania*, or that form in which the intellectual and moral nature are simultaneously affected, may be described as a state of raving incoherence, combining a rapid succession of thoughts, often brilliant and original, with passionate excitement and intense restlessness. In many of these cases reference is constantly being made, in language of extreme violence and gestures of intense anger, to events that occurred at or about the time of the first seizure.

555. *General intellectual mania*, or that which attacks the intellect alone, is admitted to be of rare occurrence. There is, however, a form of mania in which some one emotion or passion, such as pride, vanity, or love of gain, obtains such ascendancy over the mind as to fill it with a host of intellectual delusions. Thus, patients in whom the passion of vanity is greatly excited, appropriate to themselves all the great intellectual performances which they have heard praised; those in whom pride is predominant imagine themselves a series of great men; and those in whom the love of gain is excited believe themselves engaged in extravagant and impossible speculations.

556. *Partial intellectual mania*, or *monomania*, otherwise designated as *melancholia*, admits of being subdivided into two subordinate classes, the one comprising those cases in which the unsoundness is not connected with any bodily sensation, the other in which such a sensation forms an essential part of the malady. These latter cases are sometimes known as *hypochondriasis*, sometimes as *melancholia.*

557. Cases of monomania, without uneasy bodily sensation, are of common occurrence, as in men who think themselves secretaries to the moon, or objects of persecution, or subjects of plots formed against their lives. In most of these cases the attack is gradual, but, like one form of dementia, they sometimes date from a sudden shock. Such was the case of Simon Brown, the dissenting clergyman, who, having killed a highwayman in a struggle, fancied ever after that the Almighty had deprived him of his immortal soul, and, stranger still, that the reigning monarch had the power of restoring it to him.

558. The second class of cases of partial intellectual mania, or those connected with some disordered bodily sensation, are very common, and are remarkable not less for the extreme improbability of the interpretation which the imagination attaches to the sensation than for its pertinacity. These cases are common in women, and often assume the shape

of imaginary pregnancy. Thus, a woman with hydatids in the womb thought herself pregnant by the devil; and two females suffering from adhesion of the intestines after peritonitis, believed, the one, that a whole regiment of soldiers fought and struggled in her belly, the other, that the same narrow space was the scene of frequent interviews between the apostles and evangelists, the patriarchs and the pope. In men the imagination is not less active, nor the delusions less remarkable. Thus, one dyspeptic attributes his discomfort to a Caffre who got into his stomach at the Cape of Good Hope; others to men on horseback; and others again, forgetting their sex, believe, like the Scythians of old, that they have been transformed into women, and have even become pregnant.

This form of unsoundness bears an obvious resemblance to those dreams which consist in an uneasy bodily sensation dressed up with imaginary accompaniments.

559. Bordering on this form of unsoundness, but less easily traced to disordered bodily sensations, are such cases as those of the man who was afraid of passing urine lest he should drown the town: or of the men who fancy that they have noses of wax or glass, or feet of straw; perhaps also the case of the woman who was afraid to bend her finger, believing the world to hang on it, and that of the gentleman who thought himself the Crystal Palace, and, when Parliament decreed its removal, accused it of wishing to destroy him.

560. In the least unreasonable forms which this strange malady assumes, as when patients believe that they have frogs, toads, and serpents in their stomachs, cures have been effected by ingeniously-contrived surgical operations; and their complete success would seem to imply that the uneasy sensations may have entirely disappeared, and yet the mental malady remain.

561. One circumstance connected with this class of mental maladies, and which applies more or less strictly to all forms of unsoundness, is the consistency with which the patient supports the part his fancy has assigned to him. If a man believes himself made of glass, he moves about with caution; if of wax, he avoids the fire and sun; if he thinks his head has been turned, he dresses accordingly, and, if he fancies that poison is being put into his food, he will eat eggs, or fruit which he has gathered, and drink only water which he has drawn from the spring.

562. Closely allied to this last form, in this as in some other respects, is that class of cases in which, in lieu of a painful bodily sensation, there is an uneasy state of mind, due primarily to some painful shock or disappointment; and passing into a belief that some person, or class of persons, is conspiring against the patient. Luigi Buranelli and McNaughten were madmen of this class. Buranelli's delusion, however, was purely personal, while McNaughten believed himself an object of persecution to whole classes of the community. As these suspicions are commonly associated with that exaggerated estimate of the importance of certain bodily sensations which constitutes *hypochondriasis*, superficial or careless observers confound these cases with the more simple and harmless forms

of that disease. But experience shows that these patients are very dangerous to society.

563. The form of mania now known as *moral mania* was not recognised till a comparatively recent period. Pinel has the credit of having first pointed it out, and Prichard of having forcibly directed attention to it. It consists in "a morbid perversion of the natural feelings, affections, inclinations, temper, habits, and moral dispositions, without any notable lesion of the intellect, or knowing and reasoning faculties, and particularly without any maniacal hallucination." When combined with a like affection of the intellect it becomes *general mania.* It usually precedes the intellectual form, the delusions of the intellect springing out of morbid perversion of the feelings. Let this case be taken as an illustration. A solicitor, who, for many years, had conducted his business to the satisfaction of his partners and clients, had during the whole of that time tortured an unoffending wife by acts which no author would dare to commit to writing. At length he has an attack of acute mania, and claims to be the Deity, the Saviour, the King of England, the heir apparent, and other dignitaries incompatible with each other. From this attack he recovers, has a speedy relapse, shows signs of softening of the brain, and dies imbecile and paralytic.

564. Moral mania, like intellectual mania, may be either *general* or *partial.* Of *general moral mania* Frederick William of Prussia, father of Frederick the Great, affords an excellent example, combining drunkenness, household tyranny, religious austerity, disgusting personal habits, and repeated attempts at murder and suicide, with an intellect by no means wanting in power or culture.

565. *Partial moral mania* consists in the excitement of some one passion or propensity to a degree which places it beyond the control of the higher faculties. In many cases the intellect and conscience remain intact, leading to struggles of which it is impossible to exaggerate the misery. The forms of this partial moral mania generally recognised are *kleptomania*, or a propensity to theft; *erotomania*, or amorous madness (in females, *nymphomania;* in males, *satyriasis*); *pyromania*, or a propensity to incendiarism; *dipsomania*, or a propensity to drunkenness; *homicidal monomania;* and *suicidal monomania;* to which might be properly added, an irresistible propensity to lying and begging, unconquerable pride, irrepressible vanity, unappeasable gluttony, and that most horrible form of it, *lycanthropy*, or wolf-mania. Of these forms of partial moral mania, kleptomania and pyromania are most common in females, the remainder in males; but cases of all the forms may occur in either sex.

566. Partial moral mania, whatever its form, is usually of some continuance; but there is a class of cases known as *instinctive mania*, in which the disease manifests itself suddenly, and most frequently as *homicidal monomania.*

567. The history of such cases is very remarkable. The victim of

the insane violence is either a perfect stranger, or an infant incapable of offence, or a near relation, to whom the homicide is tenderly attached. After the fatal act no attempt is made to escape, the deed is openly confessed, and its legal punishment courted and desired. But this insane impulse may assume a less simple form; the thirst for blood may be a chronic passion, and, like the uneasy bodily sensations and mental states just referred to, may clothe itself in the fantastic garb of monstrous intellectual delusions, as happened in the parricide Dadd.

568. The forms of mania, general and partial, intellectual and moral, present infinite varieties, and occasion the greatest perplexity to medical men when they are called upon to examine patients suffering from them, to give evidence concerning them, or to sign certificates. This perplexity is increased by the very nature of the legal questions which the physician is expected to answer—questions framed by men without experience of madness, and reasonably apprehensive of the injury which society might sustain if those who seem to be criminals should escape direct and speedy punishment; but addressed to those who know what madness is; who think that the truth has higher claims upon them than the safety of the public, or the satisfaction of those ignorant and thoughtless persons whose ready assent to received doctrines constitutes public opinion; and who, it should be added, deem imprisonment for life in a gaol or a madhouse a more serious matter than death itself.

569. Some advantage may perhaps accrue from an endeavour to bring the leading characteristics of mania together into one point of view. It should be understood, then, that this form of unsoundness consists not in the loss of the mind's faculties, but in their perversion; that the senses are the sport of illusions of which the patient cannot detect the unreality, and the mind of delusions of which he cannot perceive the inconsistency or impossibility; that real sensations become, as in sleep, the materials of imaginary scenes; that the realities by which the patient is surrounded are blended with illusions, and real persons made to undergo strange transformations in obedience to his delusions; and that many of his strange antics and acts of violence are mixed results of his illusions and delusions. It ought also to be understood that the state of the patient's mind is subject to great variation from external and internal causes; that the transition from one state to another is often as rapid as thought itself; that he is capable of exercising, for considerable intervals of time an extraordinary control over himself, so as to be able to conceal his delusions; that, though sometimes easily imposed upon, he often evinces, in carrying out his insane purposes, all the forethought and preparation of a sane man; that in his wildest excitement he is often so far conscious of what he is doing as to recollect it many years afterwards, his statements being confirmed by sane persons having cognizance of the facts to which the patient refers; and that he may even be conscious of his state and of the legal relations in which it places him.

For more full and complete information on mental physiology and pathology, the reader is referred to such works as Abercrombie on the 'Intellectual Powers,' or to special treatises on Insanity.

CHAPTER IV.

SYMPTOMS AND SIGNS OF DISEASE.

THE symptoms and signs of disease which are deserving of special consideration are, the urine, the pulse, the heart's beat, and the respiration. Others, as the tongue, the sputa, the evacuations from the bowels, the attitude of the body, and the expression of the countenance, are of less importance. The symptoms and signs first named will therefore be treated in separate sections, together with the examination of the abdominal and thoracic cavities; the remainder will be treated of collectively in one section. The contents of the present chapter may therefore be conveniently arranged as follows:—1. The Urine; 2. The Abdomen; 3. The Chest, and the organs of Respiration and Circulation; 4. The Pulse; 5. The Respiration; 6. Other Symptoms and Signs of Disease.

1. THE URINE.

Properties of Healthy Urine.

570. *Physical Properties.*—Healthy urine, recently voided, has the temperature of the body, is perfectly transparent, and of a light amber colour, has a peculiar, but not unpleasant odour, which disappears on cooling, a salt and bitter taste, and a specific gravity ranging from 1005 to 1033.

571. *Chemical Properties.*—It has a slight acid reaction, remains unchanged when heated to the boiling point, and yields precipitates with the salts of baryta, silver, and lead, but none with the mineral acids. Oxalic acid produces a slight cloud of oxalate of lime, and the free alkalies throw down a precipitate of the phosphate of lime. Tannin causes a slight cloudiness.

572. *Decomposition.*—After standing some time, slight clouds of mucus form, and slowly sink to the bottom of the vessel. An unpleasant odour is soon perceived, and the urine takes on an alkaline reaction, and effervesces with acids. Carbonate of ammonia is formed by decomposition of the urea, and the ammoniaco-magnesian phosphate with phosphate of lime are thrown down. Part of these salts entangled by mucus form a scum in which we may detect, by the microscope, crystals of ammoniaco-magnesian phosphate, amorphous phosphate of lime, and the constituents of mucus. Decomposition continuing to advance, the odour becomes more disagreeable; a blue or grey mould forms on the surface; and prismatic and feathery crystals of triple phosphate, and amorphous phosphate of lime, collect at the bottom, or cling to the sides of the vessel.

573. *Constituents.*—These are either organic or inorganic. The *organic* constituents consist of urea, uric (lithic) acid, hippuric and lactic acids, salts of ammonia, and extractive matters, with small quantities of creatine and creatinine. The *inorganic* consist of carbonic, hydrochloric, sulphuric, and phosphoric acids, combined with soda, potash, magnesia, and lime, with traces of silica. These matters are dissolved or suspended in a variable quantity of water.

574. The variation in the quantity of water, and of the solid constituents, due to age, sex, time of day, character of food, and amount of exercise, renders it impossible to give more than an approximate analysis of this fluid. The following in round numbers is a rude approximation to the mean of several recorded analyses:—

Water	950	
Urea	..	25
Uric Acid	..	1
Fixed Salts	..	14
Organic Matter	..	10
	950	50
Total		— 1000

575. The solid residue, after removing the variable element of water, will be seen from the following table, which is also founded on several analyses, to be subject to much variation:—

	Max.	Min.	Mean.
Urea	500	300	420
Uric Acid	16	14	15
Extractive Matter, Chloride of Sodium and Salts of Ammonia	509	258	381
Alkaline Sulphates	120	81	103
Alkaline Phosphates	68	45	59
Phosphate of Lime and Magnesia	19	14	16

576. *Quantity.*—The quantity voided in twenty-four hours varies in different persons, and in the same person at different times. The following are estimates of authors:—Haller, 49 oz.; Simon, 45 oz.; Keill, 38 oz.; Christison, 35 oz.; Prout, 32 oz. (30 oz. summer and 40 oz. winter); Rayer, 21 to 57 oz.; Dalton's experiments on his own person, 48½ oz. (November), 51½ oz. (June). Average about 41 oz. It may, therefore, be stated at about two imperial pints.

577. The quantity of urine in health is chiefly determined by the liquid taken into the stomach; but it is affected by many other causes. It varies inversely as the pulmonary and cutaneous exhalation; and is greater in winter than in summer, on cold than on warm days, in moist than in dry air; during the day than during the same number of hours at night, and in the morning than in the evening. It is also increased by excitement and anxiety of mind.

578. In disease, also, the urine is increased whenever the pulmonary and cutaneous transpiration is suppressed, excepting only those cases in which all the secretions are simultaneously diminished by high febrile action. In the cold stage of ague, under strong nervous excitement, and in hysterical paroxysms, an increased flow takes place. This increase, which may amount to 30 or 40 pints daily, is not accompanied by any change in the solid constituents. But in other cases the increase of water is attended by increase of solid contents, or by the introduction of an abnormal constituent, such as sugar or chyle.

579. On the other hand, the urine is diminished by increase of the cutaneous and pulmonary transpiration, by profuse diarrhœa, and in cholera; by hæmorrhage; in dropsy; in many forms of acute inflammation; and in the inflammatory stage of fever. It is suppressed, or greatly diminished, in inflammation of the kidney, and under the operation of active irritant poisons.

580. The quantity of the solid constituents is also subject to considerable differences in healthy persons. The most important constituents, urea and uric acid, are at a maximum in men in the prime of life, less abundant in females, and at a minimum in old age and childhood. They are increased by exercise and diminished by rest, increased under an animal diet, and diminished when vegetable food only is taken.

581. *Density.*—This ranges from 1005 to 1033, and averages 1020 or 1025. Simon assigns it a range of 1005 to 1030, and an average of 1012; and Dr. J. C. Gregory a range for the adult of 1005 to 1033, the greatest range in the same individual being 21, and the ordinary range 15 degrees. The average deduced from 363 experiments on 50 individuals was 1022·5, and from 5 individuals, whose urine was examined between 20 and 50 times each, 1025·2.

582. The urine is more dense in males than females; and the density increases from childhood to manhood, to fall again in old age; it is increased by hot weather, much exercise, free perspiration, a dry diet, nitrogenous food, and during sleep. It is diminished by cold, sedentary habits, a watery diet, vegetable food, and acids; also by alcoholic fluids. It is at its average in the morning on waking; falls considerably after breakfast; rises gradually after mid-day; sinks immediately after dinner, but in a few hours rises higher than at any other time: and in the course of the night gradually returns to its average.

583. The urine secreted after the digestion of food differs widely from that formed after fluids have been taken. The former, the "urina chyli," contains, according to Nysten, thirteen times as much urea, sixteen times as much uric acid, and four times as much saline matter as the latter, the "urina potus." It has also an alkaline reaction.

584. The density of the urine in disease may vary from 1001 to 1055; and as the density in health does not appear to fall below 1005, nor rise above 1033, it follows that any number below 1005 and above 1033 should be regarded as a sign of disease, and any number approaching either limit should attract attention. A less density than 1005 indicates

an increase of water, with a decrease of some of the solid constituents. A greater density than 1033 affords a strong presumption of diabetes, though 1030—1035 has been observed in cases of increased secretion with excess of urea.

585. The *solids* discharged in the urine in 24 hours average less than an ounce and a half. In a vigorous healthy adult male they may be taken at two ounces, or nearly 1000 grains. In disease they have been known to rise as high as 36 ounces, and to fall as low as 11 grains.

586. The *colour* of healthy urine is inversely as its quantity; when scanty, it is high-coloured; when abundant, pale. In the morning it is usually of a darker tint than later in the day. In disease, also, the colour bears some proportion to the quantity; but it is materially affected by diseased products. It may be white, or bluish-white, and turbid from the admixture of chyle, milk, mucus, or pus, or of the earthy phosphates in excess; deep yellow, or greenish yellow, from bile or cystic oxide; dark red or purplish, from the purpurates, as in inflammatory diseases; yellow-red, as in hectic and the sweating stage of ague; brownish or cherry-red, from the admixture of the red particles of the blood; black, from melanic, and blue, from cyanuric, acid. Several substances taken with the food, such as rhubarb, madder, beet-root, corn-poppy, and log-wood, are also said to tinge the urine red.

587. The natural *odour* of the urine, best perceived when it is scanty and high-coloured, disappears with dilution. It is altered by some kinds of food, such as asparagus; is aromatic in many nervous affections; ammoniacal in injuries of the spinal cord; putrid from admixture of pus or mucus, in diseases of the urinary organs, and in putrid fevers; sweetish in diabetes mellitus; and it has the odour of sweetbriar or of violets when it contains cystine, and probably under other circumstances.

588. The *taste* of the urine is perceptibly sweet in well-marked cases of diabetes mellitus.

The Urine in Disease.

589. The abnormal conditions of the urine are of two kinds:—

(1.) Its normal constituents may be in excess or defect.

(2.) It may contain substances foreign to its normal composition.

This second class admits of further subdivision as follows:—

(1.) Salts of ammonia and lime, of which the constituents exist in healthy urine, namely, carbonate and oxalate of lime, and carbonate of ammonia.

(2.) Substances which result from the imperfect assimilation of the food, or from defective elimination in the kidney; namely, chyle, fat, milk, sugar, bile, and cystine, to which may be added kyestein, found chiefly in the urine of pregnant women.

(3.) Blood; or its constituent red particles, fibrine, and albumen.

(4.) Secretions of the membrane lining the urinary organs; namely, mucus, and epithelial scales (these exist in small quantity in healthy urine), pus, and casts of the urinary tubes.

(5.) Animal secretions derived from neighbouring organs, as semen and the gonorrhœal and leucorrhœal discharges; also entozoa.

(6.) Poisons and medicines.

Examination of the Urine.

590. For this purpose we resort to chemical tests and the microscope. Our tests have to be applied either to the urine as it is passed, or after it has remained at rest for some time, and we may have to examine both the clear supernatant portion and the deposit. The microscope is used to identify the deposited matters, or those thrown down by chemical reagents.

591. *Tests.*—Those in most common use are turmeric and litmus paper, heat and nitric acid. Hydrochloric and acetic acids, liquor ammoniæ, and liquor potassæ, are also frequently employed; and, for certain purposes, alcohol, and solutions of oxalate of ammonia, of sulphate of copper, and of oxalic acid, are needed. A spirit-lamp, and fragment of platinum foil, and an urinometer, or 1000 grain bottle, complete the list of apparatus commonly required.

592. For microscopic examination we require a few conical glasses (wine-glasses will answer the purpose) and a pipette. The deposits are allowed to collect for several hours in the bottom of the glass, are then drawn off by the pipette, and transferred to a glass cell; or a drop of the urine is placed on a glass slide, and protected by a fragment of thin glass.

593. The urine submitted to examination should be either an average specimen of the entire day, or the first voided in the morning. It should be protected by a cover, and care should be taken to avoid the introduction of extraneous matters. Those likely to be found in the urine are depicted in Dr. Beale's "Use of the Microscope in Clinical Medicine Illustrated."

594. In order to present a complete view of this subject, the principal indications of the tests will first be described, and then the chemical and microscopical properties of the several constituents of the urine.

Turmeric paper is changed from yellow to brown by alkaline urine; blue *litmus paper* to red when the urine is acid. *Heat* throws down albumen, and also the phosphates when in excess, but it dissolves the urates of soda and ammonia. *Nitric acid.*—This throws down a dead-white precipitate of albumen; it precipitates uric acid after some hours, and dissolves it with effervescence; it also dissolves the oxalate of lime and the alkaline and earthy phosphates; it precipitates the colouring matter of bile of a green colour, but if added in excess, it changes it quickly, first to a dingy red, and then to a brown; it also detects urea in excess, when added to an equal quantity of urine, by the formation of crystals of the nitrate. Moreover, it produces a cloudiness in urine containing certain essential oils. *Hydrochloric acid* precipitates uric and hippuric acid, and throws down the colouring matter of the bile of a green colour, whatever the quantity added. It also dissolves the oxalate of lime, cystine, and the phosphates. *Acetic acid* produces a cloudiness in urine containing mucus; it dissolves the alkaline phosphates, and the phosphate of lime sparingly. *Sulphuric acid* added to warm urine containing sugar or albumen, causes a deposit of carbon. *Caustic ammonia* throws down the earthy phosphates as a white precipitate, and dissolves cystine; its vapour imparts a rich purple hue to the crystals of uric acid. *Oxalic acid in solution* throws down a characteristic oxalate of urea. *Oxalate of ammonia* is used to detect the presence of the phosphate of lime. *Caustic potash* dissolves uric acid and the urates of soda and ammonia, and with the aid of heat disengages ammonia from the urate; it also tinges saccharine urine a dark-brown, and thickens purulent deposits. A *solution of sulphate of copper*, rendered strongly alkaline by caustic potash, when heated with saccharine urine, detects the sugar by causing a deposit of the red oxide of copper. *Alcohol*, by the aid of heat, dissolves cholesterine and hippuric acid.

The following are the chemical and microscopic characters of the principal constituents of the urine in health and disease.

595. *Urea.*—This in excess gives a high specific gravity to the urine (1·030—1·035). If abundant, it may be detected by adding to a little urine in a watch-glass an equal bulk of strong nitric acid. The mixture, if kept in a cool place, deposits crystals of nitrate of urea. When the quantity of urea is small, we evaporate before applying the acid.

The best process for detecting urea and obtaining well-formed crystals of the nitrate is the following: Evaporate some urine over a water-bath to the consistence of a syrup; add strong alcohol, filter the alcoholic solution, and evaporate it nearly to dryness; add a few drops of water and of strong nitric acid. Crystals of nitrate of urea are speedily formed, which assume, under the microscope, the form depicted in Fig. 12. For practical purposes the presence of urea may be readily detected by evaporating a few drops of urine on a glass slide, and adding an equal quantity of nitric acid.

Fig. 12.

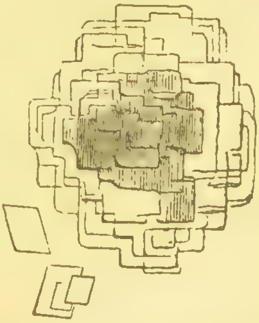


Fig. 13.

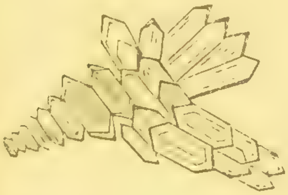
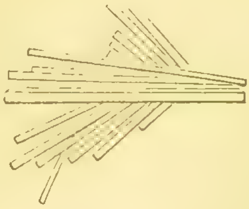


Fig. 14.



If we substitute oxalic for nitric acid, we obtain crystals of the form shown in Fig. 13. The alcoholic extract of urea leaves, on spontaneous evaporation, acicular crystals of the form shown in Fig. 14.

596. *Uric Acid.*—Uric or lithic acid sometimes exists in the urine in such quantity as, on cooling, to separate from it in the form of a crystalline deposit. It is occasionally voided as gravel, and is a frequent constituent of urinary calculi. In urinary deposits it has every tint from light yellow to deep orange-red, or dark-brown. Hence the familiar names of "yellow and red sand." Occasionally it is quite free from colour.

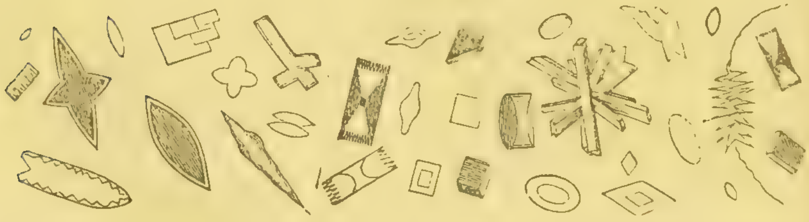
Urine which yields uric acid deposits has generally a high colour, an acid reaction, and a specific gravity of 1·020 or more. The acid may be separated from urine which yields no deposit on cooling, by adding hydrochloric acid in the proportion of two or three drachms to six or eight ounces. The mixture, after standing in a covered vessel for twenty-four to forty-eight hours, yields a red or reddish-brown sediment of uric acid.

The crystals also vary in size from grains visible to the naked eye, and known as *Cayenne pepper grains*, to a fine sand, in which the characteristic forms of the crystal are only to be detected under high powers of the microscope.

597. Uric acid is insoluble in hot and cold water: is not redissolved when the urine is heated; is very soluble in caustic potash, and is precipitated granular and colourless from this menstruum by the addition of an acid in excess; it is dissolved by nitric acid with effervescence, and on evaporation to dryness yields a red or pink residue, which is changed to a rich purple (murexide) by vapour of ammonia. Heated on platinum-foil uric acid burns, gives out an odour of bitter almonds, and leaves a scanty white ash; when heated on porcelain it yields a crystalline sublimate to a superimposed disk of glass.

Under the microscope uric acid displays a great variety of forms. Its proper shape is rhomboidal; but it may assume one or other of the forms shown in fig. 15, some of which are comparatively rare. (One member of the group represents the acid crystallized on a hair.)

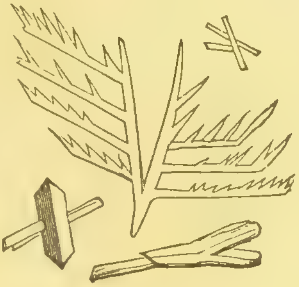
Fig. 15



598. *Hippuric Acid.*—This, which abounds in the urine of herbivorous animals, exists also in human urine. It may be obtained by evaporating a few ounces of urine to the consistence of syrup, and adding hydrochloric acid in excess. A mixture of uric and hippuric acids is thrown down. This deposit, having been washed in cold water, is boiled with alcohol, which dissolves the hippuric acid. On evaporating

the spirituous solution, the acid is deposited in the form represented in Fig. 16.

Fig. 16.



599. The *Urates* or *Lithates*.—These deposits are often very abundant, generally falling as the urine cools, but occasionally they are voided with it. They are rarely quite white, sometimes bright red, and they may assume any tint from light yellow to dark brown. They are soluble in warm water and in warm urine. Alkalies dissolve them, and acids in excess throw down crystals of uric acid, which, when treated successively with nitric acid and ammonia, yield the rich purple murexide.

600. *Urate of Ammonia*.—This salt is sometimes diffused through the urine, so as to give it the ropy appearance of muco-pus; in other cases it forms a whitish or a reddish-brown deposit, known as the *lateritious* or *brick-dust* sediment.

Urate of ammonia shares with the other urates the properties enumerated in § 599; but it has the characteristic property of giving out ammonia, when heated with liquor potassæ. Its microscopic appearance is depicted in Fig. 17. The granular deposit known as urate of ammonia often consists of the mixed urates of soda, ammonia, lime, and magnesia.

Fig. 17.

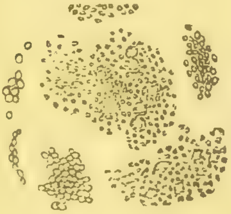
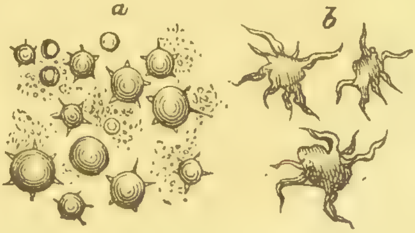


Fig. 18.



601. *Urate of Soda*.—Is rare as an unmixed deposit, but is sometimes met with in gout, and in fever patients treated with carbonate of soda. It has the chemical properties common to the urates. It tinges the outer flame of the blowpipe yellow. Under the microscope it presents the characteristic form seen at *a*, Fig. 18; *b* being a rare variety (Beale).

602. *Oxalate of Lime*.—This is rarely seen as a granular deposit, but is often diffused through the urine as minute octahedral crystals. It is a common constituent of urinary calculi, and the material of the "mulberry calculus." It is insoluble in water, liquor potassæ, and acetic acid; but soluble in nitric acid, and converted at a red heat into *carbonate of lime*, identified as such by dissolving with effervescence in acids.

603. Oxalate of lime may be obtained for chemical or microscopic examination by allowing one or two ounces of the urine to stand for a few hours in a conical wine-glass. Part of the lower stratum is then withdrawn by the pipette, placed in a watch-glass, and gently heated.

Crystals of the oxalate are deposited, and may be collected at the bottom of the glass by carefully rotating the fluid. After allowing it to be at rest for a few minutes, the fluid portion may be withdrawn by the pipette, its place being supplied by distilled water. The white glistening powder, again collected in the centre of the glass by gently rotating it, may be transferred by the pipette to the field of the microscope.

604. The crystals of oxalate of lime so obtained generally appear under the microscope as flattened octahedra, with one short axis and two longer ones (Fig. 19); but they may also assume the form known as the *dumb-bell crystal* (Fig. 20). Crystals of this shape are believed to be generally, if not always, formed in the kidney itself. They differ from the octahedra inasmuch as they polarise light, and are perceptibly acted on by acetic acid, which destroys their polarising power. Dumb-bells more or less perfect are depicted in Fig. 20. Both octahedra and dumb-bells are found adhering to casts of the urinary tubes. Octahedra so adhering are shown in Fig. 35, p. 138.

Fig. 19.

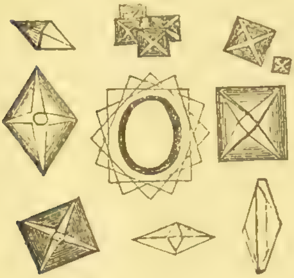
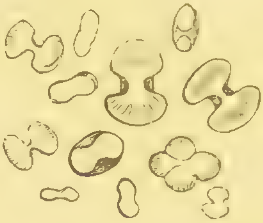


Fig. 20.

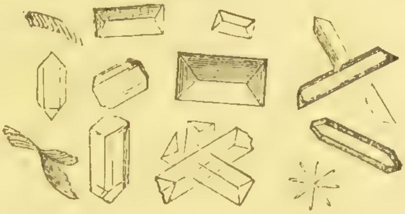


605. *The Phosphates.*—Phosphoric acid exists in urine in combination with alkaline and earthy bases, as, 1. The ammonio-phosphate of magnesia, or the triple phosphate. 2. The ammonio-phosphate of magnesia, with excess of ammonia, known as the basic or bibasic phosphate. And 3. Phosphate of lime. These deposits have the following properties in common. They generally occur in neutral or slightly-alkaline urine; are white unless tinged with blood; are not dissolved by heating the urine which contains them, but are, on the contrary, thrown down by heat; they are soluble in weak acids, but insoluble in water, in ammonia, and in liquor potassæ. The phosphate of lime is less soluble in acids. Heated separately they fuse with great difficulty; but when combined in nearly equal proportions, the phosphate of lime and the triple phosphate fuse readily, constituting the *fusible calculus.*

606. 1. *The ammonio-magnesian phosphate, or triple phosphate.*—On adding a few drops of ammonia to healthy urine, it becomes turbid, and deposits the triple salt combined with phosphate of lime. The same result may happen from the development of ammonia or its carbonate when the urine is retained in the bladder for a long time, as in cases of paraplegia, or allowed to stand some hours out of the body. It is also common in diseased states of the mucous membrane of the

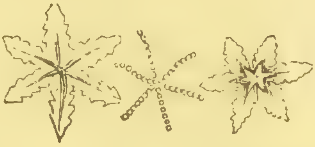
bladder. The triple phosphate may present itself in any of the following forms:—*a.* As a white crystalline gravel. *b.* As a thin iridescent film on the surface of the urine. *c.* As a dense white deposit closely resembling mucus. *d.* In masses or ropes resembling mucopus. Under the microscope the triple phosphate assumes some of the annexed forms. It is very common as triangular or four-sided prisms with truncated ends (Fig. 21).

Fig. 21.



607. 2. *The basic or bibasic phosphate* (triple phosphate, with excess of ammonia) has the microscopic characters shown in Fig. 22.

Fig. 22.



3. *The phosphate of lime* occurs as an amorphous deposit, or in little rounded particles, usually found adhering to the crystals of the triple phosphate.

608. *Cystine.*—This curious substance is characterised by the great excess of sulphur that enters into its composition. It is not found in healthy urine, and is a rare product of disease. It constitutes a form of urinary calculus, but very seldom exists as a deposit. The urine which contains it is usually of a pale-yellow tint, of low specific gravity, and of an odour resembling sweetbriar. The deposit of cystine is white, or of a pale-fawn colour, distinguished from white urate of ammonia by not disappearing on heating the urine which contains it; and from the earthy phosphates by its insolubility in dilute hydrochloric or strong acetic acid. It is at once distinguished from all other deposits by its ready solubility in ammonia. The crystals are hexagonal plates of variable thickness, but generally thin, and often superimposed, as in Fig. 23. The ammoniacal solution yields, on evaporation, the same well-formed hexagonal plates or prisms, but sometimes the clustered crystals figured in the engraving. Cystine is often found blended with uric acid and the urates.

Fig. 23.

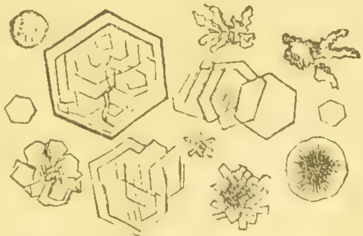
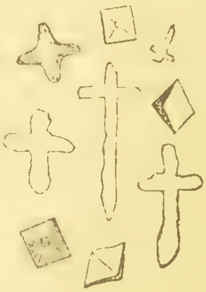


Fig. 24.



609. *Chloride of Sodium.*—Common salt sometimes appears as crystals on evaporating the urine. Their proper form is the cube, but on hasty evaporation they have an irregular cruciform appearance (Fig. 24). Sometimes, as in the figure, they are octahedra.

610. *Chyle.*—Chylous urine, on cooling, gelatinises spontaneously, as-

suming the appearance and consistence of *blanc-mange.* It contains large quantities of albumen and fat.

611. *Fat.*—Urine may contain fat in a separate form, or as a constituent of chyle or milk. It is also frequently met with in the shape of oil-globules attached to epithelial cells, or casts of tubes. (See § 583, Fig. 7 *b*, and § 628, Fig. 33.) The quantity of fat may be ascertained by evaporating a portion of the urine, dissolving the deposit in ether, evaporating the solution, and weighing the residue.

612. *Milk.*—Urine containing milk is turbid and pale, and contains fat globules and colostrum corpuscles. Milky urine does not coagulate by heat, unless the quantity of lactic acid be large, or unless it also contains albumen. On adding to a little urine moderately warmed a few drops of acetic, dilute sulphuric, or hydrochloric acid, flocculi of coagulated caseine are formed. The quantity of caseine may be determined by collecting these flocculi, washing and drying them, and dissolving out the oil-globules by æther.

613. *Sugar.*—This may sometimes be detected by the taste, especially if we first evaporate the urine to the consistence of a syrup; but this test is inconvenient in practice, and not to be depended on. The specific gravity of the urine affords certain evidence of the existence of sugar only when it exceeds 1·035, which is probably the highest figure for urine containing urea in excess. The specific gravity of diabetic urine ranges from 1·020 to 1·050. When the symptoms lead to a suspicion of the presence of sugar, it may be detected by one or more of the following tests:—

(1.) *Trommer's Test.*—Add solution of sulphate of copper till the urine has a faint blue tint; then add liquor potassæ in excess. Hydrated oxide of copper is thrown down, but dissolves in the excess of alkali. On boiling the liquid, if sugar be present, the red suboxide of copper, varying from a light orange to a deep crimson tint, is thrown down.

(2.) *Fehling's Test-solution.*—This may be conveniently substituted for the sulphate of copper and caustic potass of Trommer's test. It is prepared by dissolving 69 grains of sulphate of copper in five times its weight of distilled water, and adding a concentrated solution of 268 grains of tartrate of potash, and then a solution of 80 grains of caustic soda in one ounce of distilled water.

The following tests have been recommended, but are less free from objection than the foregoing:—

(3.) *Moore's Test*, with *liquor potassæ.*—Pour the urine supposed to contain sugar into a test-tube, add half its bulk of liquor potassæ, and boil for one or two minutes. The urine assumes an orange-brown tint of depth proportioned to the quantity of sugar.

(4.) *Runge's Test,* with *dilute sulphuric acid.*—Evaporate a small quantity of the urine on a surface of white porcelain, add to the warm liquid a few drops of dilute sulphuric acid (one acid to six water). If sugar be present, a deep brown or black deposit of carbon is formed. This test is delicate, but not conclusive, as albumen yields a similar result.

(5.) *Capezzuoli's Test.*—Drop into the urine a few grains of the blue hydrated oxide of copper, and then add a little liquor potassæ, so as to render the liquid alkaline. If sugar be present the fluid assumes a reddish tint, and in a few hours the fragments of the oxide turn yellow, first at the edges, and then through the whole mass: this arises from the reduction of the oxide to the suboxide.

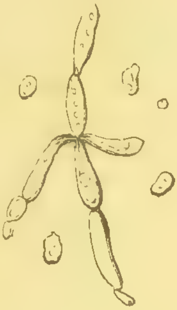
(6.) *Horsley's Test.*—Add to the urine an alkaline solution consisting of chromate of potass and liquor potassæ, in equal proportions, and boil. The liquid will assume a deep sap-green colour, due to the reduction of the oxide of chromium.

(7.) *Crystallization Test.*—Evaporate the urine to the consistence of a thick syrup, and digest in hot alcohol. Pour the cooled alcoholic solution into a large test-tube, and allow it to evaporate spontaneously. The sugar will crystallize on the sides in white granules.

(8.) *Fermentation Test.*—On adding yeast to diabetic urine, and raising the temperature to 80°, effervescence takes place, a brisk discharge of gas ensues, and a yellowish liquid is formed, which has the odour of beer, and yields alcohol by distillation. One part of sugar in 1000 parts of healthy urine of the density 1030 may be detected by this means. The test was first suggested for animal fluids by Gmelin, and for urine by Christison.

(9.) *Torula Test.*—Expose the urine for a few hours to a temperature above 70°. A drop taken from the scum that covers the surface, and placed under the microscope, exhibits oval vesicles, which rapidly grow into a species of conferva, to which the term *torula* has been given. This formation, however, is not peculiar to diabetic urine. (Fig. 25.)

Fig. 25.



614. The quantity of sugar may be determined with a fair approach to accuracy by the Fermentation test, which is thus performed. A graduated tube is filled with mercury, leaving space for little more than the requisite quantity of urine, which is then introduced. What remains of the space is filled with yeast. The open end of the tube is then closed with the finger and reversed in a vessel of mercury. The graduated tube is then exposed to a heat of 70° or 80° for twelve hours or more. Since the fluid thus introduced dissolves its own bulk of carbonic acid, the measure of the fermented liquid added to that of the undissolved gas, will give the quantity of carbonic acid; from which the weight of sugar is inferred by allowing one grain for every cubic inch of gas.

615. *Bile.*—Urine containing bile is of a deep yellow-brown colour, and if the quantity be considerable, of a bitter taste. The bile may be detected by any of the following tests:—

(1.) *Nitric Acid.*—To a few drops of the urine on a white surface of porcelain, add a drop of nitric acid. If bile be present, green and pink colours will show themselves.

(2.) *Pettinkoffer's Test, Sulphuric Acid and Sugar.*—To a few drops of the urine on a white surface of porcelain add a drop or two of strong sulphuric acid, and, while the mixture is hot, add a drop of strong syrup. If bile be present a fine purple colour will be produced.

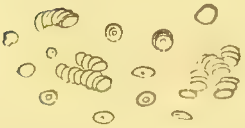
(3.) A third test has been proposed by Schwertfeger. It consists in throwing down the bile as a yellow precipitate, by acetate of lead, and dissolving the precipitate in alcohol acidulated with sulphuric acid. To the green solution thus obtained, Pettinkoffer's test may be applied.

Tests 1 and 2 are most expeditious, and, therefore, to be preferred.

616. *Kyestein.*—This, though not peculiar to pregnant women, is found in most cases of pregnancy. It consists of a film of fat, a matter resembling caseine, and crystals of ammoniaco-magnesian phosphate. It forms upon the surface of the urine in periods varying from thirty hours to eight days, but generally on the third day. The urine is either neutral or ammoniacal at the time of its formation. After standing some time the pellicle breaks up and falls to the bottom. The sediment has the disagreeable pungent odour of decayed cheese.

617. *Blood.*—Blood is sometimes voided with the urine in small defined clots, readily recognised; but, in other cases, it tinges the urine a bright red, brown, or bistre-red. The colour alone is not conclusive, as other colouring matters produce similar appearances; but its nature is easily ascertained, either by the discovery of blood corpuscles under the microscope, or by the effect of heat and nitric acid, which throw down a dirty-brown coagulum, consisting of albumen blended with the colouring matter. The urine also assumes a bright-red tint when treated with a strong solution of common salt.

Fig. 26.



618. *Blood Corpuscles.*— When not dissolved in the urine, the blood corpuscles form a dark brown-red sediment, in which their forms (see Fig. 26) may be detected by the microscope.

619. *Fibrine.*—This substance is voided in the form of casts of the tubes, or as a constituent of clots of blood. Coagula and flocculi of fibrine are readily distinguished from mucus by their amorphous appearance under the microscope, and the absence of epithelial scales.

620. *Albumen.*—Tests—heat, and nitric acid. These should always be employed at the same time. For heat will throw down the phosphates if they be in excess, and the acid may render the urine turbid if it contains an essential oil, as that of cubebs or copaiba. Should the phosphates in excess coexist with an essential oil, both heat and nitric acid would throw down a white precipitate. The addition of an acid will dissolve the phosphates; the essential oil may be separated by æther, after which the urine will have its usual reaction. Corrosive sublimate in solution is also a delicate test for albumen, but the two tests just mentioned are those commonly employed.

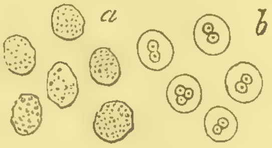
621. *Mucus.*—A small quantity of mucus is present in healthy urine without affecting its transparency. In disease it may be blended with it in any proportion, from a slight cloud to a quantity sufficient to cause it to pour from one vessel to another as a viscid ropy fluid; and when the quantity is considerable, and the result of acute inflammation of the

mucous membrane, and especially when it is blended with an excess of phosphates, it may form a distinct deposit closely resembling pus. Urine containing mucus has generally an alkaline reaction, and is not coagulated by heat or nitric acid, unless albumen be also present. Acetic acid coagulates it.

622. *Pus.*—Urine containing pus is commonly either acid or neutral: and, on standing, deposits the pus as a distinct cream-coloured layer, readily diffused through the fluid by agitation. The deposit is not dissolved by acetic acid; it is rendered viscid and more consistent by liquor potassæ, and, when shaken with æther, yields a quantity of fat. The urine, freed from its purulent deposit, is coagulated by heat and nitric acid. In alkaline urine, pus has something of the viscidity of mucus.

Under the microscope pus presents a number of opaque spherical bodies, consisting of a cell-membrane enclosing nuclei, oil-globules, and minute granules. The addition of acetic acid renders the envelope transparent and the nuclei more distinct, as in Fig. 27, in which *a* represents the ordinary appearance of the pus granule, and *b* of the same granule on the addition of acetic acid. Mucus presents similar microscopic appearances, but the particles are not so distinctly granular.

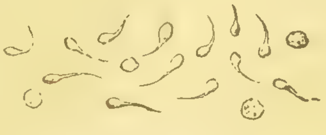
Fig. 27.



623. *Diagnosis of Pus and Mucus.*—Much stress was formerly laid on the importance of distinguishing pus from mucus, and many methods were devised for effecting that object. But it is now well understood that, though there is a great difference between pus and healthy mucus, there is very little between pus and the mucus of an inflamed membrane. The only satisfactory means of distinction is heat or nitric acid. Urine containing pus is coagulated by these reagents, while urine containing mucus is not, unless it also contains albumen derived from some other source.

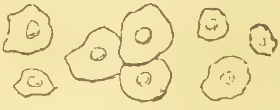
624. *Semen.*—Occasionally the seminal fluid which lines the urethra after emission becomes washed away by the urine, and may be recognised in it by the peculiar appearance of the spermatozoa (Fig. 28). The examination should be made soon after the urine is passed, with a quarter or an eighth power, and the object not too strongly illuminated.

Fig. 28.



625. *Epithelium.*—The epithelium scales, which are found blended with pus and mucus, and are often discharged in large quantities, especially by persons suffering from the secretion of oxalate of lime, are easily recognised by their well-known microscopic characters (Fig. 29).

Fig. 29.



626. Sometimes it is desirable to be able to form an opinion on the

spot, by inspection and the use of one or two simple tests, as to the character and composition of an urinary deposit. The most common deposits may be classed as follows :—

(1.) Red crystalline sediment—Urine acid. Uric acid with colouring matter of the urine.

(2.) White crystalline sediment—Urine neutral or alkaline. Triple or ammoniaco-magnesian phosphate.

(3.) White amorphous sediment—Triple phosphate, and phosphate of lime.

(4.) Pink sediments—Urine acid. Urate and phosphate of ammonia.

(5.) Yellowish or nut-brown sediment—Urate of ammonia and soda, earthy phosphates, and colouring matter of urine.

(6.) Reddish-brown or lateritious sediment—Alkaline urate (chiefly urate of soda), earthy phosphates (occasionally), colouring matter of urine, and alkaline purpurate.

(7.) Oxalate of lime. Rare as a deposit.

(8.) Carbonate of lime } Very rare.
(9.) Cystic oxide }

(10.) Red particles of blood, pus, mucus, &c.

627. The substances contained in 2, 3, 4, 5, and 6, consist of colouring matter with alkaline urates and earthy phosphates in variable proportions. These are easily distinguished, both from each other and from certain secretions which resemble them, by shaking up the sediment and applying heat. If the sediment dissolve, it consists of alkaline urates, and chiefly of urate of ammonia; but if the fluid remain turbid, the deposit consists of the earthy phosphates, or of pus or mucus. They may be readily distinguished by the addition of hydrochloric acid, which dissolves the phosphates, but not the pus or mucus. If urine containing urates also holds albumen in solution, the urine when heated first becomes clear, and then turbid.

628. *Casts of the Urinary Tubes.*—In diseases of the kidney considerable importance attaches to a microscopic examination of the urine, with a view especially to the discovery of casts of the urinary tubes.

Diseases of the kidney which have not a local origin (such as blows on the loins, the irritation of a calculus, or retention of urine from stricture) result from an effort of the kidney to separate from the blood some morbid material, such as the poison of scarlatina, measles, erysipelas, or typhus; of gout, rheumatism, or scrofula. Imperfect nutrition consequent on an insufficient supply of food, or an imperfect action of the skin or liver, may also excite disease in the kidney; and lastly, a disease of the kidney may be produced by irritant substances, such as oil of turpentine or cantharides. In all these cases the morbid products are thrown into the urinary tubes, and being dislodged by the urine flowing through them, appear as cylindrical casts. As each form of kidney disease is attended by its characteristic cast, a careful examination of these bodies is essential to the formation of an exact diagnosis. The casts, of which the chief varieties are represented in the figures, are best seen with a power magnifying about 200 diameters.

Fig. 30. *Epithelial cast*, composed of fibrine, entangling epithelium and blood corpuscles, and indicating "acute desquamative nephritis," a form of disease not uncommon as a consequence of scarlatina, and which is analogous to the desquamation of the skin.

Fig. 31. *Granular cast*, composed of fibrine, with particles of disintegrated epithelium, characteristic of "chronic desquamative nephritis." These casts are common in the urine of men who have had numerous attacks of gout, and they may often be detected long before any other sign of renal disease. Albumen appears at a later stage.

Fig. 30.

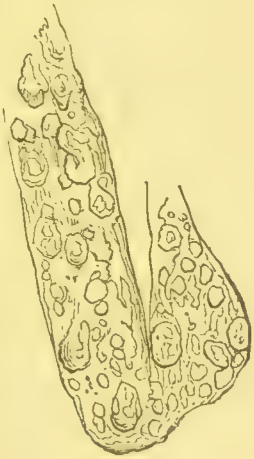


Fig. 31.

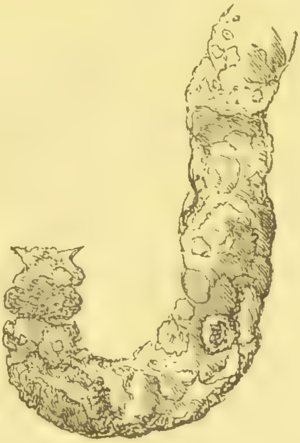


Fig. 32. *Waxy cast*, sometimes deposited in the advanced stage of chronic nephritis, but sometimes also in acute nephritis as a primary disease of the kidney.

Fig. 33. *Oily casts*, composed of fibrine, entangling oil globules and epithelial cells gorged with oil. They indicate degeneration of the kidney, the most serious and incurable form of Bright's disease.

Fig. 32.

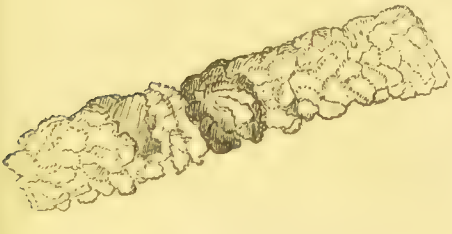


Fig. 33.

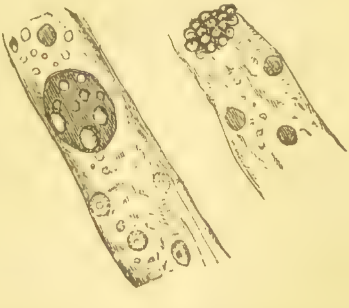


Fig. 34. *Purulent casts*, composed of fibrine entangling pus cells, and indicating suppurative nephritis; a very serious and often rapidly fatal form of disease.

Fig. 35. *Blood casts*, such as occur in strangury and hæmaturia,

after taking oil of turpentine. The blood is moulded in the kidney tubes, and affords unequivocal evidence that the hæmorrhage was renal. The crystals attached to the cast are oxalate of lime. (The wood-cuts are from the drawings of Dr. George Johnson.)

Fig. 34.

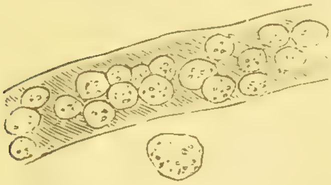
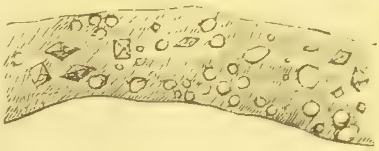


Fig. 35.



629. In diabetes, and in other morbid states in which the urine is loaded with matter in excess or foreign to its normal composition, we may wish to estimate the quantity of solid matter which it contains. This may be done by multiplying the excess of the specific gravity of the urine above that of water by the weight of the urine, and the product by 0·00233. By referring to a table in which the weight of solids in given quantities of urine of different specific gravities is stated, the amount of solids in the specimen under examination may be directly calculated from the measured quantity, which should be the whole amount passed in twenty-four hours, or a measured fraction of it. The first of the two tables given below presents the quantity of solid matter contained in 1000 grains of urine of different densities; and the second the weight of one pint of urine. The mode of using these tables will be readily seen from a single example. Suppose a patient to pass, in twenty-four hours, three pints of urine of the specific gravity of 1·030, it is required to ascertain the weight of solid matter voided in this period. 1000 grains of urine, specific gravity 1·030, contain by Table I. 69·90 grains of solid matter, and a pint of urine of the same specific gravity weighs, by Table II., 9012 grains. Hence $\frac{69\cdot9 \times 9012}{1000}$ or 629·9 grains is the quantity of solid matter contained in each pint of urine; and 629·9 × 3, or 1889·7 grains, is the total weight of solids voided in the twenty-four hours. This calculation gives a sufficiently close approximation to the actual weight of saccharine matter in cases of diabetes mellitus.

TABLE I.

Solids in 1000 *Grains of Urine of different Densities.*

Specific Gravity.		Solids.	Specific Gravity.		Solids.
1·001	-	2·33	1·010	-	23·30
1·002	-	4·66	1·011	-	25·63
1·003	-	6·99	1·012	-	27·96
1·004	-	9·32	1·013	-	30·29
1·005	-	11·65	1·014	-	32·62
1·006	-	13·98	1·015	-	34·95
1·007	-	16·31	1·016	-	37·28
1·008	-	18·64	1·017	-	39·61
1·009	-	20·97	1·018	-	41·94

Specific Gravity.	Solids.
1·019	44·27
1·020	46·60
1·021	48·93
1·022	51·26
1·023	53·59
1·024	55·92
1·025	58·25
1·026	60·58
1·027	62·91
1·028	65·24
1·029	67·57
1·030	69·90
1·031	72·23
1·032	74·56
1·033	76·89
1·034	79·22
1·035	81·55
1·036	83·88
1·037	86·21
1·038	88·54
1·039	90·87
1·040	93·20
1·041	95·53
1·042	97·86
1·043	100·19
1·044	102·52
1·045	104·85
1·046	107·18
1·047	109·51
1·048	111·84
1·049	114·17
1·050	116·50

TABLE II.

Weight of a Pint of Urine of different Densities.

Specific Gravity.	Weight of one Pint.
1·010	8837
1·011	8846
1·012	8855
1·013	8863
1·014	8872
1·015	8881
1·016	8890
1·017	8898
1·018	8907
1·019	8916
1·020	8925
1·021	8933
1·022	8942
1·023	8951
1·024	8960
1·025	8968
1·026	8977
1·027	8986
1·028	8995
1·029	9003
1·030	9012
1·031	9021
1·032	9030
1·033	9038
1·034	9047
1·035	9056
1·036	9064
1·037	9073
1·038	9082
1·039	9091
1·040	9099
1·041	9108
1·042	9117
1·043	9126
1·044	9134
1·045	9143
1·046	9152
1·047	9160
1·048	9169
1·049	9178
1·050	9187

2. The Abdomen and Organs of Digestion.

630. *The Abdomen.*—To facilitate description, the chest and abdomen are divided into a number of distinct parts or regions by imaginary lines drawn from fixed points, as in Figs. 36 and 37.

This division is made, in the first place, by four horizontal lines passing round the trunk of the body—the first (*a a*) at the level of the clavicles, the second (*b b*) at the level of the point of the ensiform cartilage, the third (*c c*) at the level of the cartilages of the tenth ribs, and the fourth (*d d*) at the highest points of the crests of the ilia. The abdomen is further subdivided into seven regions (three central and four lateral) by two vertical lines (*e e*) springing from the middle point of each groin, and meeting the horizontal line (*b b*).

Fig. 36.

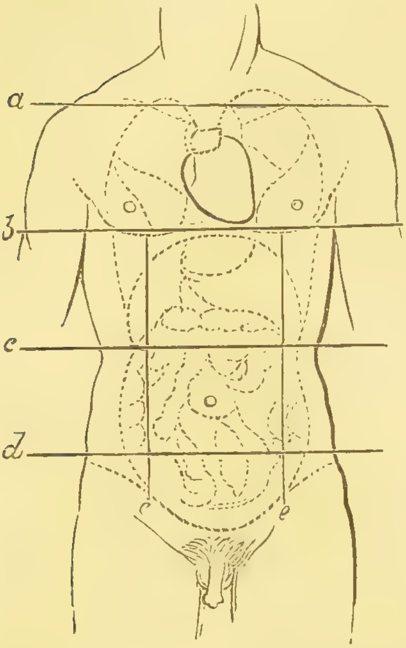
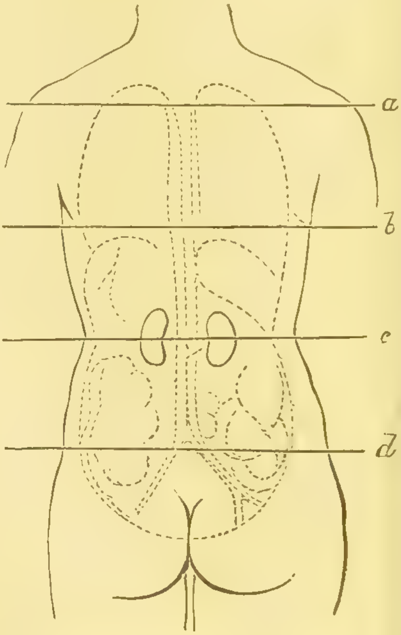


Fig. 37.



The three central regions thus formed are named in the order from above to below, the epigastric, the umbilical, and the hypogastric; the four lateral regions, taken in the same order, are the right and left hypochondriac, and the right and left iliac. The portion of the abdomen immediately above the line of Poupart's ligament is commonly known as the inguinal region.

631. The organs situate in each of these regions are as follow:—The *epigastric* contains the middle portion of the stomach and the pylorus, the left lobe of the liver, the lobulus spigelii and hepatic vessels, and the head of the pancreas; and behind these, the cœliac axis, the semilunar ganglion, and part of the vena cava, aorta, vena azygos, and thoracic duct. The *umbilical* contains the omentum and mesentery, the transverse portions of the duodenum and colon, and some convolutions of the jejunum. The *hypogastric* is occupied by the bladder and part of the small intestines. Behind the bladder is the uterus in the female, and the rectum in the male. The *right hypochondriac* contains the right lobe of the liver and the gall-bladder, part of the duodenum and ascend-

ing colon, the renal capsules, and part of the right kidney; the *left* contains the large end of the stomach, the narrow extremity of the pancreas, the spleen, part of the colon, the renal capsules, and upper part of the left kidney. The *right iliac* region contains the cæcum, the termination of the ileum and the commencement of the colon; the *left*, the sigmoid flexure and part of the descending colon.

632. The posterior regions, formed by continuing the horizontal lines *b b*, *c c*, and *d d*, are divided by a vertical line following the course of the spine into four regions, the right and left dorsal, and the right and left lumbar. The *right and left dorsal* contain the upper portions of the kidneys. The *right lumbar* contains the cæcum and lower part of the right kidney; the *left*, the sigmoid flexure of the colon, and lower portion of the left kidney.

633. When any of the organs are distended or enlarged, they encroach upon surrounding parts, and occupy adjoining regions. Thus, the distended stomach or bladder may encroach on the umbilical region; the distended colon may rise into the epigastric; and the enlarged liver or spleen may descend into the right or left iliac.

634. The *size and shape* of the abdomen vary with age and sex. In the child the abdomen is large; in the spare adult, small; in the female it presents an enlargement in the hypogastric region. It varies in size, in the same person, with the full or empty state of the stomach, the quantity of gas in the intestines, and of urine in the bladder. Pregnancy, ascites, ovarian dropsy, tympanites, hydatids, enlargement of the liver or spleen, and various morbid growths attached to the several organs, may also increase the size and alter the shape of the abdomen.

635. In examining the abdomen, we employ three methods—*inspection*, *manual examination*, and *percussion*. In certain cases we resort to measurement, and in a few instances to auscultation.

636. By *inspection*, we ascertain the size, form, and movements of the abdomen. The size is increased by any of the causes just specified; and the form is altered, either throughout the entire cavity, or in parts, according as the cause is extensive or limited. The history of changes of form is very important. Thus, the gradual, uniform, and central enlargement of pregnancy, the lateral enlargement in the first stage of ovarian dropsy, and the equal and gradual growth of ascites, form important means of diagnosis.

637. The movements of the abdominal parietes afford important indications, especially those of respiration. Thus, in peritoneal inflammation, as well as in painful affections of the abdominal muscles, respiration is performed by the chest alone. On the other hand, in pleurisy and in painful states of the muscles of the chest or of the diaphragm, the respiration is performed chiefly by the muscles of the abdomen. Again, when the abdomen is greatly distended, the action of its muscles is nearly suspended, and respiration is performed by the chest and diaphragm. In

extreme cases, the viscera are pressed against the diaphragm, and respiration is performed solely by the muscles of the chest.

638. By the *touch*, we gain further information as to the size, form, shape, tension, and movements of the abdomen, including the movements of respiration. The pulsations of the aorta are also perceptible to the touch in cases of aneurism, of tumours situate over it, and of accumulations of fæces. We also ascertain by the touch the temperature and degree of sensibility of the abdomen. The *temperature* should be compared with that of other parts of the body. In acute peritonitis, and in severe febrile affections accompanied with abdominal inflammation, the surface is very hot, and has a peculiar pungency.

639. In testing the *sensibility* of the abdomen, pressure should first be made gently, and with the open hand. If this gives pain, and inflammatory fever is present, the peritoneum is inflamed; but if there is no fever, the seat of the pain may be inferred to be the muscular walls of the abdomen. If a slight touch produces no pain, we apply stronger pressure. If deep and moderately strong pressure occasions rather a feeling of soreness than of acute pain, we may conclude that inflammation of the mucous membrane of the stomach or intestines is present. The pain due to inflammation of the peritoneum is best developed by a lateral pressure, causing the peritoneum to slide over the intestines. In colica pictonum, strong pressure relieves pain, and forms an important means of diagnosis. Muscular pain, also, is relieved by gentle pressure, gradually increased; but, on the sudden removal of the hand, the muscles are thrown into action, attended by acute suffering. Muscular pain, too, is rarely accompanied by constitutional disturbance, and, like neuralgia of the skin, is often dependent on, or associated with, an irritable state of the spinal cord. The contraction of the muscles in the act of expiration is another cause of pain which must be distinguished from the effect of pressure.

640. In applying pressure to the abdomen, we should always mark the expression of the countenance, as this is much more to be depended on than the patient's answers, especially when typhous symptoms are present, or the brain is affected. When the abdomen is very tender, the patient will throw the muscles into rigid tension, so as to shield its contents from pressure; and we have to suspend our examination till the patient's attention is diverted. When the tenderness is in the right hypochondriac region, and the cause disease of the liver, the right rectus muscle is generally found in a state of rigid contraction.

641. If, in examining the abdomen, we discover a tumour, or are anxious to ascertain the state of any of its contents more exactly, we relax the muscles by placing the patient on the back, with the head slightly raised and bent forward, the arms extended by the sides, the thighs bent nearly at right angles on the trunk, the knees apart and turned outwards, and the feet resting on the bed in contact with each other. The patient must also be directed to use as little muscular effort as possible, and his attention must be diverted from the examination

which is going on. In this relaxed state of the abdominal parietes, the size and position of tumours, and the dimensions of the viscera, are readily ascertained. In women, a combination of abdominal swelling and tension with extreme tenderness is sometimes met with, under the name of *phantom tumours*. The pain or pressure is so great as to prevent a complete examination; but under the administration of chloroform the pain ceases, the abdominal walls become supple, and the work of examination is rendered quite easy.

642. *Percussion* may be performed either directly with the points of the fingers, or by the intervention of a plate of ivory or wood, or of a finger of the left hand. Applied in this latter manner over the site of the stomach, or over any part of the small or large intestines containing air, it elicits a clear sound. In the epigastric region, in ordinary states of the stomach, and over any part of the intestines largely distended with air, the sound is tympanitic. The clear sound is somewhat modified if the air be mixed with fluid. Percussion, on the other hand, elicits a dull sound when applied over solid viscera, over collections of fluid, over hollow viscera when quite free from air, over the intestines when containing only fæces, over the enlarged liver or spleen, and over solid tumours.

643. Percussion and the touch are employed together in detecting the presence of fluid. This is best done in the upright posture. The palm of one hand is placed on one side of the abdomen with a firm but gentle pressure, while the fingers of the other hand tap lightly and quickly on the part directly opposite to it. If fluid be present, a peculiar and characteristic vibrating shock is experienced.

644. Direct percussion with the points of the fingers is used to distinguish muscular pains of the abdomen. A slight quick touch throws the muscles into action, and so causes pain. This, together with the absence of pain on firm pressure gradually applied, its recurrence on the sudden removal of the pressure, the acute pain produced by every movement of the affected muscles, and the absence of urgent constitutional symptoms, combine to distinguish muscular pains from those due to disease of deep-seated parts.

645. *Measurement* of the abdomen is sometimes resorted to. A common tape graduated to eighths of an inch answers the purpose. No precautions are necessary beyond noting whether the measure is taken during inspiration or expiration. When the abdomen is uniformly enlarged by a tumour or collection of fluid, and especially when successive measurements are required, the tape should be applied at the level of the umbilicus.

646. *Auscultation* is occasionally resorted to in examining the abdomen, to confirm, by means of the friction-sound, the diagnosis of peritoneal inflammation. This sound is caused by the rubbing together of two surfaces roughened by deposits of lymph. By using the stethoscope, we may also hear the pulsations of the aorta in spare persons, and may

detect the placental murmur and the pulsations of the fœtal heart. The first is a blowing sound, synchronous with the pulse of the mother, and best heard in the iliac regions near the groins. The second is a double sound, not unlike the ticking of a watch, occurring from 120 to 160 times in a minute, and best heard about the centre of the left iliac region. It is rarely audible till the end of the fifth month.

In taking notes of cases of abdominal tumours or enlargement of viscera, their size and extent, as indicated by percussion, may be conveniently figured on outlines kept for the purpose. The figures annexed will serve to illustrate the use of such outlines. Fig. 38 shows the regions of dull and clear sound in the healthy subject, in which *a* shows the dull region of the liver, and *b* that of the spleen ; while *c* indicates the region of clear sound over the stomach moderately distended, and *d* that of the colon similarly distended. The fainter shadow (*e*) indicates the parts of the abdomen which, when empty, yield a moderately dull sound, when filled with flatus a clear (tympanitic) sound, and when filled with solid matters (as with fæces) a full dull sound. Fig. 39 shows the dull region of the liver (*á*) extended, as in organic disease, with enlargement ; (*b′*) a similar enlargement of the spleen, and the regions of dulness, corresponding with a distended descending colon and rectum (*f*) ; a loaded cæcum (*g*) ; and a distended bladder (*h*). The use of the shaded outlines, as applied to the heart and lungs, will be noticed in another place.

Fig. 38.

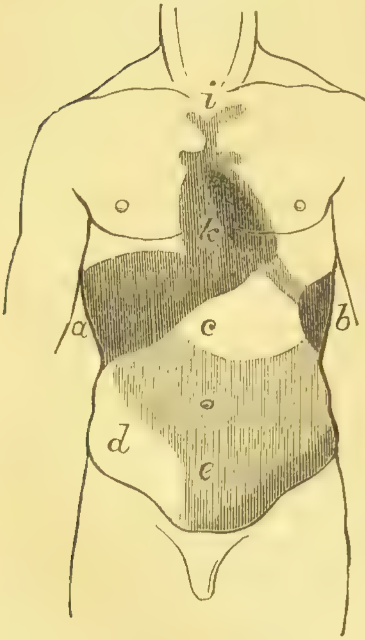
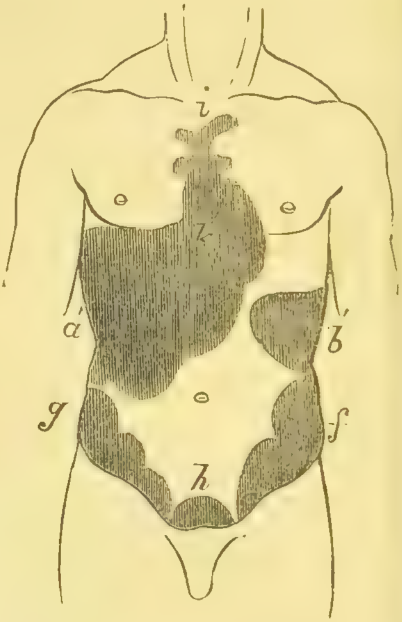


Fig. 39.



3. The Chest, and the Organs of Respiration and Circulation.

647. An examination of the external conformation of the chest must precede all inquiries into the diseases of the parts contained within it. To facilitate such examination, the chest, like the abdomen, is divided into regions, by lines drawn from fixed points. (See figures, p. 140.) The two horizontal lines (*a a* in the line of the clavicles, and *b b* on the level of the ensiform cartilage), joined by a vertical line bisecting the sternum, divide the chest anteriorly into two principal regions, of which certain parts are designated by characteristic names. Those beneath the clavicles are known as the subclavian regions, and those above them as the supra-clavicular regions. The parts marked by the nipples are called the mammary regions, and the armpits are known as the axillary regions.

648. On the back of the chest the scapular, inter-scapular, and infra-scapular, or superior dorsal regions, correspond—the first to the scapula of either side, the second to the space between the two. and the third to that part of the chest immediately below the angles of those bones.

649. The size, shape, and movements of the chest may be ascertained by *inspection*, *manual examination*, and *measurement*.

650. *Inspection.*—A well-formed chest is large in all its dimensions, and round in its outlines. The spine is straight, or, in very strong men, and those who use the right arm much, curved almost imperceptibly towards the right. The chest appears symmetrical; but when measured, the right side is found to be larger than the left by about half an inch; and there is naturally somewhat more fullness above and immediately beneath the clavicle on the left than on the right side, from the left lung rising higher than the right. The chest is wider and longer in men, but deeper in women. Women are also more subject to distortions of the chest and spine.

651. A glance at the chest enables us to judge of its size. Closer examination is required to detect deviations from its usual form. The chief distortions affecting both sides alike, are those arising from the use of stays in the female, and from constrained posture in the male. Of the latter, the most remarkable is the flattened chest of the shoemaker. Alterations in the shape of both sides of the chest also arise from diseases affecting equally both lungs; such as tubercles, leading to contraction, especially in the subclavian region, and dilatation of the pulmonary cells (emphysema), causing a considerable enlargement about the middle of the chest. Alterations in the shape of one side, or of a limited portion of one side, may arise from more than one disease of the corresponding lung. Pleurisy, both acute and chronic, causes enlargement of the affected side; but in certain chronic cases there is contraction. In hydrothorax, also, and in pneumothorax, the size of the affected side is increased. When the dilatation is extreme, the intercostal spaces are raised to a level with the ribs. More partial changes arise from circumscribed

pleurisy and limited adhesions. In advanced cases of phthisis, the position of a cavity is often indicated by the falling in of one of the intercostal spaces. Certain changes in the size and shape of the chest also arise from diseases of the heart and of the large vessels.

652. Inspection also enables us to ascertain the character of the respiration; whether tranquil or hurried, easy or difficult; abdominal, as in acute pleurisy or acute pleurodyne, or thoracic, as in acute diseases of the abdomen and severe rheumatic affections of the abdominal muscles or diaphragm. The character of the heart's impulse may also be ascertained by inspection.

653. *Manual Examination.*—By this, as by inspection, we ascertain the development of the muscles, the thickness of the parietes of the chest, the presence of œdema or emphysema of the integuments, heat and soreness of the skin, local tenderness, or muscular pain. The extent and character of the heart's impulses may also be ascertained by the hand, and it is usual to apply the two hands to corresponding parts of the chest when we wish to compare the respiration on the two sides.

654. The skin of the chest is preternaturally hot in inflammation of the lungs.

655. Firm pressure in the intercostal spaces often causes pain when the pleura is inflamed, either generally or partially. This partial tenderness occurs in consumption, when the pleura covering a cavity is inflamed, or when a collection of pus is making its way externally.

656. The chest is a common seat of muscular pains. Pain in the side (pleurodyne), is a consequence of violent efforts in coughing; and pain in the left side is a very frequent occurrence in weak and delicate females. These muscular pains, which are apt to be mistaken for pleurisy, are developed by slight percussion with the points of the fingers, by the movements of the arms or trunk, and by a deep inspiration. The absence of pain on firm and gradual pressure, with its recurrence when the support is suddenly removed, is also a good diagnostic of muscular pain. Percussion with the fingers throws the muscles visibly into action through the whole length of their fibres, and causes remarkable partial and transverse contractions, which are best seen in emaciated persons, and especially in advanced cases of consumption. These partial contractions may also be excited in the biceps and in other large muscles.

657. *Measurement.*—This may have to be resorted to in disease as a means of diagnosis; in health, as a measure of strength and vigour.

In disease we may wish to ascertain the size of the chest or of certain portions of it, or to determine the degree of expansion and enlargement which the whole, or parts of it, undergo during the act of inspiration. The progressive enlargement or diminution in its size which accompanies certain forms of disease, may also be ascertained by repeated measurements made with great care, in the same position, and in the same state of the cavity. A graduated tape may be used for this purpose. To measure the size of the chest the tape should be carried horizontally round it, passing over the two nipples, or at an equal distance above or below them. When the amount of expansion due to the movements of inspiration is to be ascertained, one end of the tape should be firmly held by one hand to the spine, while the other is allowed to slide freely through the other held over the centre of the sternum. The chest should first be measured after a full expiration, then after a deep inspiration: by shifting the tape we may measure the degree of expansion of both sides of the chest. In making these measurements the fact that the right side is naturally larger than the left by half an inch, must be borne in mind. The expansion of the chest in ordinary inspiration does not exceed an inch and a half, and it is somewhat greater on the right than on the left side.

658. In examining the chest with a view to test the strength and vigour of healthy persons, as in recruiting for the army, we must be provided with certain standards of comparison, and also make allowance for the different degrees in which the muscles are developed, and the parietes clothed with fat. In these examinations the expansion of the chest in inspiration ought always to be noted. The act should be performed with evident ease and freedom; and the tape drawn tightly across the nipples should show a movement of not less than an inch.

659. The greatest circumference of the chest in robust men varies from 39 to 42 inches; and in spare men of medium height ought not to fall much short of 35 inches. In robust men the circumference of the chest bears to the height the proportion of about 1 to 1·75. If in a man of 5 feet 4 inches, the average circumference is taken at 38 inches, an allowance should be made of half an inch in the chest-measurement for every inch added to the stature.

Stature.	Circumference of Chest.	Stature.	Circumference of Chest.
64	38	69	40½
65	38½	70	41
66	39	71	41½
67	39½	72	42
68	40	73	42½

660. It ought, however, to be understood, that the chests of very tall men are not so large in proportion to their height as those of men of medium stature. These taller men do not bear fatigue so well as those of shorter stature.

661. A stethometer, or instrument for measuring inspirations, has been invented by Dr. Richard Quain. It consists of a string passing round the chest, adjusted in the act of expiration, and as the chest expands by inspiration, indicating the enlargement by a hand moving on a dial-plate. Dr. Sibson employs a similar instrument, especially for measuring the movements of particular portions of the chest.

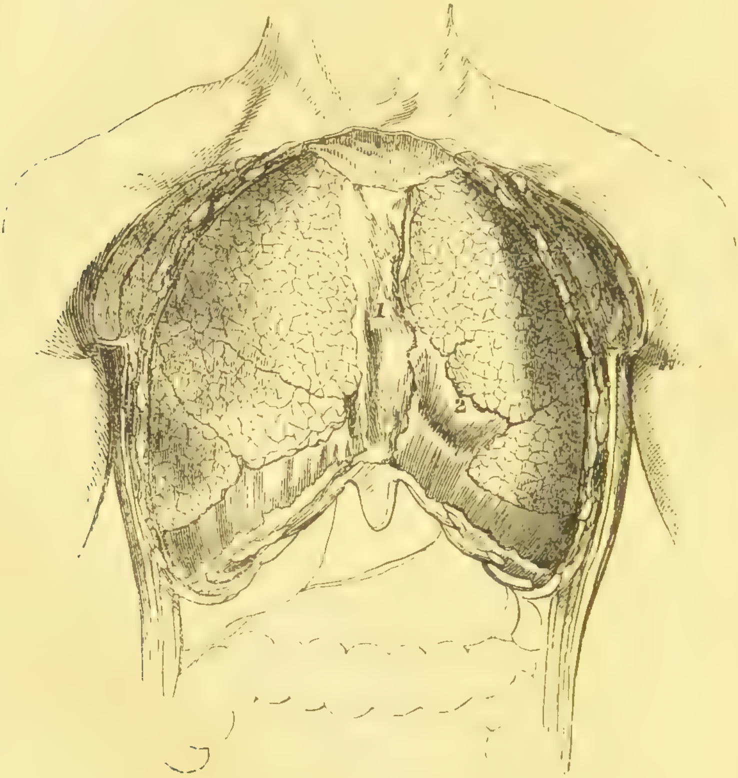
THE LUNGS.

662. The cavity of the chest consists of a hollow cone, of which the apex is cut off by a horizontal plane, corresponding with its upper open-

ing, and the base by an oblique plane, looking forwards and downwards, constituting the lower opening. The upper opening is filled by the trachea, œsophagus, and large blood-vessels: the lower is closed by the diaphragm. This conical cavity is flattened before where the cartilages of the ribs join the sternum, and behind, where the ribs unite with the spine; but it is rounded at the sides where it is formed by the ribs and their cartilages.

663. The principal organs contained within the chest are the lungs and heart. The size of the chest corresponds closely with that of the lungs, and is liable to various deformities from diseases affecting those organs. The size and shape of the chest are also altered in certain diseases of the heart and large vessels.

Fig. 40.

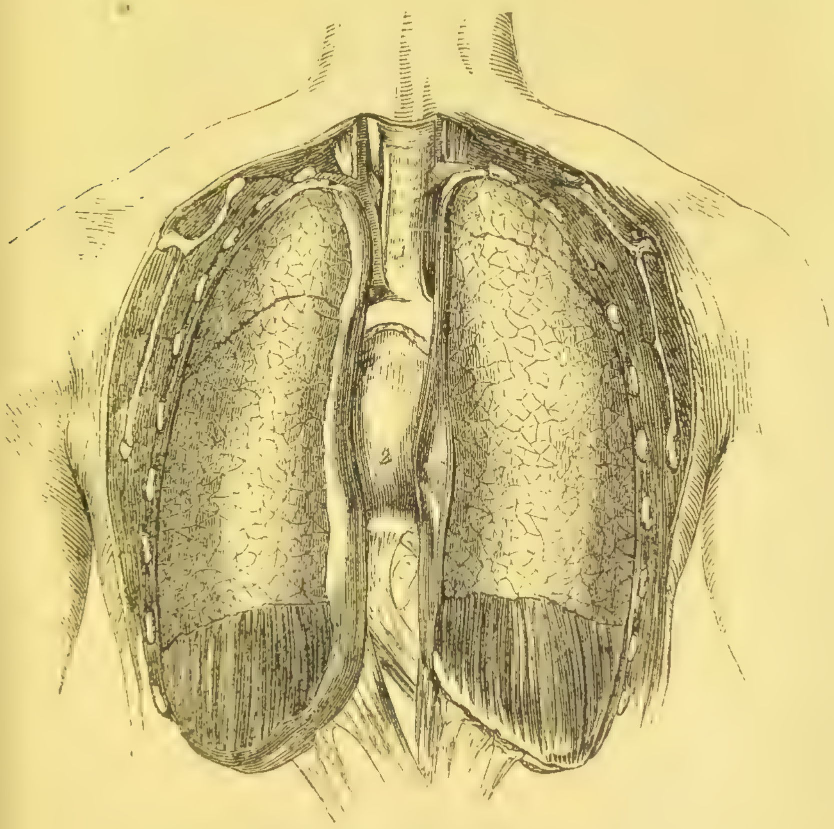


664. The lungs are in close contact with the walls of the chest in every part, with the exception of a small space (2, Fig. 40) to the left of the sternum, where they leave part of the middle mediastinum containing the heart uncovered, and a narrow space (1) behind the sternum corresponding to the track of the large vessels.

665. Of the two lungs the right is the larger, the left the longer, its

apex rising higher, and its base sinking lower. The right lung reaches to the level of the sixth rib in front, of the eighth rib at the side, and still lower behind. The left extends to the level of the seventh rib in front, it reaches the eighth rib at the side, and descends still lower behind. Both lungs applying themselves closely to the diaphragm, descend much lower behind than before, being there prolonged into thin wedges. The diaphragm separates them from the liver on the right side, from the stomach in the centre, and from the spleen and colon on the left side posteriorly. (Figs. 40, 41, and 42.)

Fig. 41.

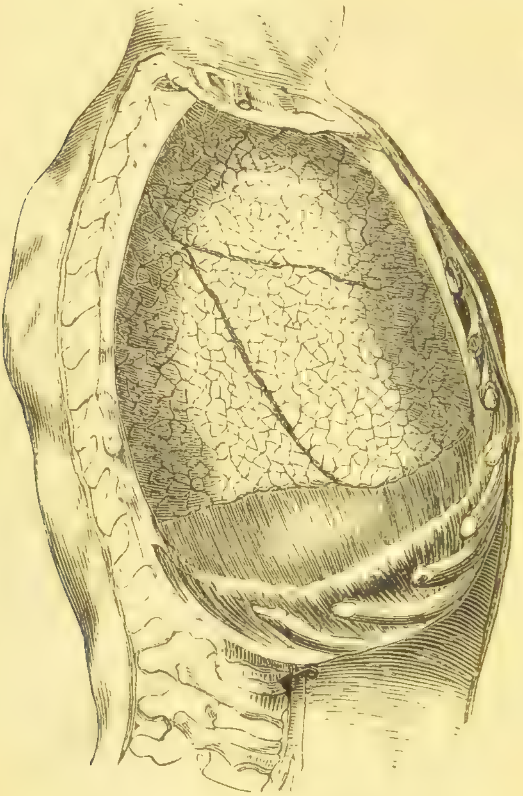


666. The chest is subjected to several kinds of examination, having special reference to the condition and functions of the lungs; our object being to ascertain, 1. The number and character of the respirations; 2. The capacity of the lungs; and, 3. The true condition of their texture.

667. *Number and Character of the Respirations.*—We may count the respirations in one of two ways: by observing the motions of the trunk, or of some article of clothing which moves as it moves, or by placing the hand on the chest or abdomen. The first method is best adapted to the sitting or erect, the last to the recumbent, posture. The most con-

venient plan is to cause the patient to lie down, to rest the hand on the abdomen, and then to grasp the wrist as if feeling the pulse. But whether we count the respirations by sight or by touch, the patient's attention should be withdrawn from the breathing, as the muscles of respiration are partially under the control of the will. The character of the respirations, whether natural, slow or quick, easy or laboured, sighing, catching, or gasping, may be ascertained in either of these ways.

Fig. 42.



668. The character of the respiratory movements differs in the two sexes and at different ages. In very young children they are performed chiefly by the abdomen; in adults of both sexes mainly by the chest. In men the lower part of the chest, in women the upper part, is brought mostly into play, both in easy and in difficult breathing.

669. In very tranquil breathing inspiration is performed by the descent of the diaphragm, marked by a gradual protrusion of the abdomen; and expiration by contraction of the abdominal walls. In ordinary breathing, however, the ribs are raised and tilted outwards during inspiration, to recover themselves by their own elastic reaction during expiration. In violent inspiration, not only the diaphragm and intercostals

are called into play, but the scapulæ are raised and fixed. In violent expiration, as in coughing and sneezing, the abdominal muscles are brought into action, by which the viscera of the abdomen are compressed and the diaphragm forced upwards into the chest. Yawning and sighing are forms of deep inspiration; coughing and sneezing, of violent expiration. Deep inspirations relieve the circulation by leaving greater space for the admission of blood into the heart, whilst violent expirations free the lungs, nostrils, and air-passages of irritating substances.

670. *Number of Respirations.*—These may be registered by an appropriate instrument. That which I devised for this purpose resembles a large watch with a dial-plate graduated to 10,000, and furnished with two hands, one of which is set in motion by a string attached to a short chain. The instrument is fastened over the pit of the stomach by a band passing round the abdomen, and the string is made tense in the act of expiration, by fastening the free end to any fixed point at a short distance from the body. Every act of inspiration accordingly, by bringing the two fixed points nearer together, relaxes the string, while every act of expiration tightens it and sets the hand in motion, causing it to traverse one space on the dial-plate. The experiments, of which the results are given under the head of THE RESPIRATION, were performed by means of this instrument.

671. *Capacity of the Lungs.*—Two plans have been proposed for ascertaining the capacity of the lungs; the one by Dr. Lyons, the other by Mr. Abernethy. The latter plan was employed by Mr. Thackrah, of Leeds, and, with some modification, by Dr. Pereira, and was afterwards much improved by Dr. Hutchinson. A portable spirometer is also in use, invented by Mr. Coxeter.

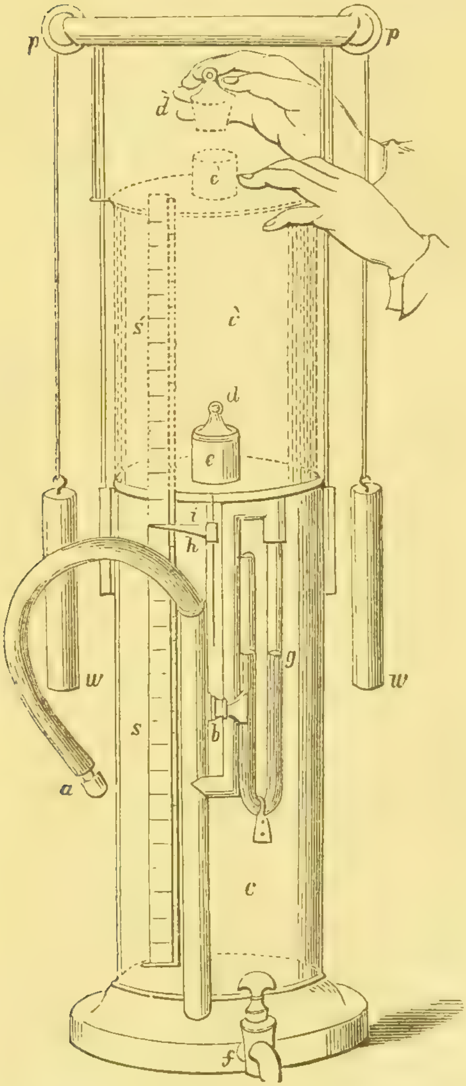
672. Dr. Lyons' method consists in noting the time required to empty the chest after a complete inspiration, by counting aloud. To render the expiration continuous and complete, the patient is directed to count from 'one' upwards, as far as he can, slowly and audibly; and the number of seconds is noted by the watch. The time so occupied is a measure of the capacity of the lungs. Dr. Lyons fixed its limit for perfectly healthy persons at thirty-five seconds: but this is too low; for in more than one trial I have myself continued to count for forty seconds. In confirmed phthisis, Dr. Lyons stated the limit at eight, and often at less than six seconds; and, in pleurisy and pneumonia, from four to nine. This method, though open to obvious objections, admits of useful application.

673. Abernethy's method consists in making the patient take a deep breath, and then causing him to expire through a bent tube into an inverted jar full of water. The water displaced measures the capacity of the lungs. A healthy person with sound lungs can displace six or eight pints. If the quantity displaced is much less than this, we infer that the lungs are diseased, or compressed. 'Muscular debility or spasm, may occasionally make the result doubtful, yet, in general, I believe it will afford useful information.'

674. This method was also employed by Mr. Thackrah, of Leeds, who

suggested its use in examining recruits. Nineteen officers and soldiers of the 14th Light Dragoons were found to have a chest capacity of from 220 to 295 cubic inches; the majority expiring from 240 to 250. In tailors the mean was 221, and in shoemakers 182 cubic inches.

Fig. 43.



675. Dr. Hutchinson improved this rude method by substituting for the jar containing water a gasometer properly poised and accurately adjusted. As his instrument is now used in some Assurance Offices, and is believed to afford useful indications in some cases of early chest affection, a woodcut, with a short description, is here introduced.

The instrument consists of a cylindrical vessel, *c*, holding several pints of water, filled by a spout at the top, and emptied by a stop-cock, *f*, at the bottom. Into this vessel a cylinder, *c*′, of smaller size, counterpoised with the weights, *w w*, is inverted. The cover of this vessel has an opening, *e*′ and *e*, in the centre, which may be closed at will by the plug, *d*′ and *d*. An elastic tube, *a*, with a glass mouth-piece, and furnished with a stop-cock, *b*, communicates with the lower vessel, *c*. The bent glass tube, *g*, also communicates with the lower vessel, as does the glazed space, *i*. A graduated scale, *s*′ and *s*, attached to, and moving with, the upper vessel, *c*′, and an index, *h*, complete the instrument. If we suppose the gasometer, *c*′, to be filled with air, so as to occupy the position indicated by the dotted lines, the instrument is prepared for use by taking out the plug, *d*, and lowering the gasometer till the coloured spirit in the two legs of the syphon, *g*, stands at the same level. The index, *h*, is then placed at the level of the water in the glazed space, *i*, which, communicating with the reservoir, *e*, shows the height of the water within, and at the zero of the scale. The plug, *d*, is now replaced, the stop-cock, *b*, being supposed to remain closed. The subject of the experiment then fills his chest completely, and applying his mouth to the mouth-piece, and at the same time opening the stop-cock, *b*, discharges the air from his lungs. The gasometer rises, the stop-cock, *b*, is again turned so as to close the passage for air, the coloured liquid in the syphon, *g*, is again brought to the level in the two legs, and the height of the scale above the index marks the number of cubic inches, and measures, if the experiment has been properly performed, the capacity of the lungs, or, to speak more correctly, 'the quantity of air which an individual can force out of his chest by the greatest voluntary expiration, after the greatest voluntary inspiration.'

676. By numerous observations made with this instrument, Dr. Hutchinson established certain averages for the healthy chest, which he then used as standards of comparison for the chests of consumptive patients. He found the limits of capacity in health to be 80 cubic inches in a dwarf measuring 3 feet 9 inches, and 464 cubic inches in a giant measuring 6 feet 11½ inches. He also ascertained that the capacity was 40 or 50 cubic inches below the mean in very fat persons; that it was reduced from 4 to 6 inches by a moderate meal, and from 9 to 14 by a full meal; that it is greatest in the erect posture; that it diminishes after 55 years of age; that it bears a remarkable relation to the stature; and that it is much diminished in pulmonary consumption.

677. The following table presents in the first column the ascertained or calculated capacity of the lungs in healthy persons between the ages of 15 and 55, of different statures, from 5 to 6 feet; and in the second and third columns the capacity of the lungs of persons of the same stature, suffering from the early and advanced stages of pulmonary consumption. (The table is taken from Dr. Hutchinson's work on the Spirometer.)

Stature.		*Capacity. Healthy Males.*	*Early Stage of Consumption.*	*Advanced Stage of Consumption.*
Feet.	Inches.	Cubic Inches.	Cubic Inches.	Cubic Inches.
5	1	174	117	82
5	2	182	122	86
5	3	190	127	89
5	4	198	133	93
5	5	206	138	97
5	6	214	143	100
5	7	222	149	104
5	8	230	154	108
5	9	238	159	112
5	10	246	165	116
5	11	254	170	119
6	0	262	176	123

678. The disparity shown between the capacity of the lungs in healthy persons, and in persons of the same stature under incipient and advanced

consumption, is so considerable as to prove the utility of this instrument. But it must be borne in mind that emphysema and bronchitis, as well as diseases of the heart encroaching on the lungs, would give rise to the same results. In making practical application of the figures it would probably be unsafe to set down to the account of disease a moderate diminution of capacity; though Dr. Hutchinson thought that if a man between 5 feet 7 and 5 feet 8 inches, who ought to expel about 220 cubic inches of air, can expel no more than 185, or a 6-foot man, who ought to expel about 260 cubic inches, no more than 200 or 220 cubic inches, disease may be suspected. When we bear in mind the modifications in the capacity of the lungs due to the causes specified in § 676, and especially that, according to Dr. Hutchinson's statement, 'very fat men, of any stature, may blow 40 or 50 cubic inches less than the mean, and yet not be diseased in the chest,' it is but reasonable to suppose that other causes compatible with health may lessen its capacity. The figures in the second column are, however, so much below those belonging to the healthy chest, as to furnish a very strong presumption of disease.

679. In using Dr. Hutchinson's instrument, the patient should be in the erect posture, and be narrowly watched to see that he performs the operation of expanding his chest and expelling the air carefully and properly. Allowance must also be made for advance in age above 55.

680. Dr. Hutchinson also made numerous observations, with an instrument of his own invention, on the force with which the muscles of inspiration and expiration draw in and expel air through the nostrils. But these experiments have obviously no very important practical bearing.

681. The instrument invented by Mr. Coxeter has the advantage of being simple, portable, and cheap, and in the hands of a practised person, using it always in the same way, would afford useful indications. It consists of two flexible, inelastic, and air-tight bags—one large, the other small—connected by a tube fitted with a stop-cock. The larger bag has a second stop-cock fitted with a glass mouth-piece; and the smaller bag, which is graduated to 50 cubic inches, has also a second stop-cock. In using this instrument we close the stop-cock between the two bags, and open that fitted with the mouth-piece, through which the patient, having taken a deep inspiration, discharges the contents of the chest into the larger bag, and closes the stop-cock to which the mouth-piece is attached. The smaller bag being empty, and its terminal stop-cock closed, the central stop-cock is opened, and the bag filled with air. The central stop-cock is again closed and the terminal one opened, so as to allow the contents of the small bag to be expelled. This done, the same process is repeated till all the air contained in the larger bag has been transferred to the smaller one and measured off. As the results obtained differ little from those yielded by Hutchinson's spirometer, the figures of the last table may be used as standards of comparison for both instruments.

682. *The Texture of the Lungs.*—To ascertain the state of the tex-

ture of the lungs, we use the two methods known as percussion and auscultation.

683. *Percussion and Auscultation.*—The ear is employed in two ways in examining the lungs,—in listening to the sounds caused by striking the walls of the cavity, and in listening to those produced by the passage of air through the lungs, and by the movements which take place between the lungs and the chest. Both these modes of examination are comprised in the meaning of the term auscultation ; but it is usual to call the first *percussion*, and the second *auscultation*.

684. *Percussion.*—If the chest were full of air, it would yield, when struck, a sound like that of an empty barrel or drum ; if, on the contrary, it were filled with solid animal substance, it would sound as dull as the arm or thigh. But containing, as it does, a spongy organ, the lung, including in its tissue a large quantity of air, it yields, when struck, a hollow sound, but one less hollow than that which it would give if containing only air. The more air it contains, the more hollow the sound ; hence it is clearer during inspiration than during expiration. If, again, the texture of the lung be so altered as to admit a larger quantity of air, as in emphysema, the chest yields a clearer sound. On the other hand, if the lung admits less air than usual, the sound becomes more dull : this happens in congestion, in inflammation, in tubercular deposit ; when solid tumours form in the lung itself, or occupy its place ; as also when the lung is compressed by fluids collected in the sac of the pleura (hydrothorax and empyema). But if, instead of fluid, there is air in the cavity of the pleura (pneumo-thorax), the sound is more hollow than if the healthy lung were in contact with the walls of the chest.

685. But the nature of the sound is also influenced by the thickness of the walls of the chest itself. If two chests contain exactly the same quantity of air, that will give the clearest sound which has the thinnest walls. Those parts of the chests too, which are padded with muscle or fat, yield a duller sound than those which are less covered with muscle. Thus, the sound is dull over the pectoral muscles and over the shoulders ; but clear above and below the clavicles, in the arm-pits, and below the angles of the scapulæ. In the healthy chest, then, the clearness of the sound will vary directly as the quantity of lung beneath the part struck, and inversely as the thickness of the parietes.

686. Again, wherever the substance of the lung is thin, the sound on percussion is modified by the parts lying immediately behind it : thus, below the fourth rib, the layer of lung in front of the liver on the right side is thin ; and the sound is less clear than in the upper part of the chest. The thin layer of lung which overlays the heart, so as to leave only a small portion of it uncovered (2, Fig. 40), has the same effect. In all such cases, gentle percussion elicits the clear sound of the healthy lung, strong percussion that of the solid substance behind it. The limits of the clear sound are somewhat extended by a deep inspiration, which stretches and expands the lungs, and diminished by a forcible expiration, which contracts them. Tumours in the deeper seated parts of the lung,

or consolidation of the lung itself, have the same effect as a solid viscus. Gentle percussion elicits the clear sound of the healthy lung, and strong percussion the dull sound of the tumour or condensed lung beneath. The clearer sound of the healthy lung is exaggerated in the parts of the chest near the stomach by the gas contained in that organ.

687. When the chest is being examined, the patient should be in the erect or sitting posture, and, if possible, in an open room, for curtains and bed-clothes dull the sound. The chest should be bare, but in females it may be covered by a single layer of clothing. Each part of the chest under examination should be rendered as tense as possible; the anterior part by stretching the neck and throwing back the shoulders; the supra-clavicular space by turning the neck to the opposite side; the axillæ, by raising the arms above the head; and the back part by causing the patient to fold his arms and stoop. In comparing opposite and corresponding points, the position of both sides must be the same. If we are examining the front of the chest, the hands must fall loosely; if the sides, they must be raised equally above the head; if the back, they must be equally folded.

688. There are different ways of eliciting the sounds of the chest by percussion. We may strike with the points of the fingers, with the flat of the hand, or with the fist, or we may interpose the fingers of the opposite hand, or a pad of India-rubber, or a plate of wood or ivory. Such things are called "plessimeters," and percussion by their aid is named "mediate percussion." When we are dealing with slight differences of sound, it is advantageous to use a plessimeter combined with a hammer in such a way as always to strike with the same force. Dr. Sibson makes use of this combination under the name of a "spring plessimeter," consisting of a round pad of India-rubber fixed to the end of an axis, and striking on a plate of ivory. The axis works through a collar, and, being raised, is made to fall each time with equal force by means of elastic springs.

689. Direct percussion with the points of the fingers should only be employed to set the muscles in action, for in many cases, especially in advanced phthisis pulmonalis, the skin and muscles are so sensitive that the slightest touch occasions pain. Percussion with the open hand, or closed fist, is little used, except as a means of contrasting the two sides of the chest over their whole extent at once.

690. Mediate percussion is always to be preferred, and the readiest plessimeter is a finger of the left hand applied to the surface with a firm pressure, by which the skin and flesh are condensed, and made better conductors of sound. This is especially necessary in stout, flabby, dropsical, or emphysematous subjects. The finger should then be sharply struck by the three middle fingers of the right hand, taking care that the stroke falls directly and not obliquely. In comparing the two sides of the chest, care should be taken to strike the same point, with the same force, and in the same state of the chest, whether full of air in inspiration, or partly emptied by expiration, or motionless as when the breath is held.

691. The chief indications given by percussion in disease, by clear and dull sounds respectively, are shown in the following table:—

	In the Lungs.	*External to the Lungs.*
Clear Sound on Percussion.	Healthy condition. Emphysema. Tubercular excavation.	Pneumothorax.
Dull Sound on Percussion.	Congestion, hepatization, and condensation. Pulmonary apoplexy. Œdema. Tubercular deposit. Other morbid degenerations.	Pleuritic effusion. Hydrothorax. Hæmathorax. Tumours in pleura or mediastinum. Diseases of heart or arteries, with enlargement.

692. From the part of the chest in which the clear or dull sound occurs, we may often infer the cause which produces it. Thus, emphysema, though it may be confined to one side, and to a limited spot, commonly occurs on both sides of the chest, and over a large extent of lung ; pneumothorax, on the contrary, is usually confined to one side, and tubercular excavations generally to the upper part of the lungs.

693. Congestion and hepatization of the lungs occupy chiefly the lower lobes, generally on one side, but sometimes on both ; œdema commonly exists in both lungs at the same time ; tubercular deposit is found chiefly in the upper lobes ; whilst other morbid degenerations occupy all parts of the lungs indifferently. Of causes external to the lungs, effusion of blood or pus into the cavity of the pleura is commonly confined to one side ; hydrothorax usually extends to both ; tumours in the pleura and mediastina may occupy any position ; diseases of the heart affect the neighbouring parts ; and aneurismal tumours chiefly the upper and anterior part of the chest.

694. *Auscultation.*—The passage of air through the structures of the lungs, in inspiration and expiration, causes certain sounds, which are heard on applying the ear or the stethoscope to the chest, and are found to vary in different situations. In the neck, and at the upper part of the sternum during inspiration, a hollow, blowing sound is heard—this is tracheal respiration ; on each side of the upper part of the sternum, between the scapulæ, and sometimes in the axillæ, a whiffing tubular sound—this is bronchial respiration ; on most other parts of the chest a sound which has been compared to that of a sleeper breathing gently through the nostrils, or to the sighing of a gentle breeze—this is called vesicular, from its presumed seat, the air-cells. This sound is heard both in inspiration and expiration ; but the expiratory murmur is less distinct and shorter. When, as in children, this breezy murmur is very distinct, it is termed *puerile respiration.*

695. The intensity of this respiratory murmur varies in different healthy persons, and in the same person at different times. It is more intense, as has just been stated, in young children and in females. It is also augmented by deep inspiration, and, therefore, may be increased by

causing the patient to breathe quick, to draw a deep breath, or to cough, whereby the lungs are emptied, and a full inspiration secured. The respiratory murmur also becomes more intense, or *puerile*, in one part of the lung by consolidation of the remainder, and in one lung by consolidation of the other ; also by partial impediments to free action of the lung, such as tight stays in women.

696. The respiratory murmur is sometimes scarcely audible ; but in the absence of other morbid sounds, and of dullness on percussion, this indistinctness does not indicate disease.

697. The respiratory murmur may also be absent in limited portions of the chest, through the bronchial tubes being obstructed by tenacious mucus ; but here percussion will give a clear sound, or it may be absent, because the air-cells are filled with fluid from within ; or compressed from without, when the chest will sound dull on percussion, unless the pressure be occasioned by air in the pleura.

698. The *bronchial* respiration in health is heard along the track of the large bronchial tubes ; but if the lung be condensed, it not only loses its proper respiratory murmur, but, being a better conductor, conveys to the ear the sound produced in the tubes. Hence, bronchial respiration heard with unusual distinctness near the site of these tubes, or heard on one side and not on the other, or with widely-differing intensity on the two sides, or in parts where it is not heard in health, is an indication of consolidation by disease or pressure.

699. The bronchial respiration, as thus heard, resembles intense puerile respiration ; or the noise made by drawing the breath through the closed hand ; or that occasioned by blowing into a quill ; or, lastly, the short puff used in blowing out a candle.

700. To the same class of sounds belongs the *cavernous* respiration, which, in its most marked form, produces a perfect illusion of air drawn through the stethoscope during inspiration, and puffed into the ear during expiration. It generally arises from a dilated bronchus, but occasionally from a cavity in the substance of the lung.

701. The *amphoric* respiration is the sound produced by blowing into a bottle, and is caused by the passage of air into a cavity lined with a dense membrane.

702. Besides the respiratory sounds produced in the tubes and air-cells of the lungs, when those parts are moistened by their natural secretions in their usual quantity, there are other sounds due to the increased resistance offered to the passage of air by constriction of the parts themselves, or by fluids of various degrees of consistence.

703. The variation in character and intensity of these sounds is indicated by the terms *râle* (rattling), *rhonchus* (snoring), *crepitation* (crackling), and *sibilus* (hissing, wheezing, or whistling). *Crepitations* are further distinguished as *dry* and *moist*—the dry being due to swollen

mucous membrane, constriction of the tubes, or obstruction with viscid phlegm; the moist to fluids of less consistence in the tubes or cells.

704. *Râles* are limited to the larynx, trachea, and bronchial tubes; *Rhonchus* and *Sibilus* to the largest and medium-sized tubes; and *Crepitation* to the fine-air tubes and the air-cells.

705. *Crepitation* is of two kinds—*fine* and *coarse*. Fine crepitation has its seat in the air-cells and smallest air-tubes; it is a very delicate sound, resembling that caused by rolling a lock of hair between the thumb and finger. Coarse crepitation is heard in the finer and medium-sized tubes, and is nothing more than fine mucous râle.

706. Crepitation is further subdivided into *moist* and *dry*. *Moist* crepitation (*râle crepitant* of Laennec) is a rapid succession of crackles, such as are produced by throwing salt on a hot iron plate. The sensation may be *felt* by compressing healthy lung tissue, or emphysematous integument. It exists whenever the finer bronchi and air-cells, partially filled with viscid fluid, still admit the passage of air. Hence it is present in œdema and apoplexy of the lungs; occasionally in pulmonary catarrh and bronchitis; often in the first stage of phthisis; and in the first stage of pneumonia, as its most constant and characteristic sign. It disappears when hepatization comes on, and reappears when the inflammation is subsiding, and the lung begins to assume its healthy condition. In the first and last of these stages the moist crepitant rhonchus obscures the respiratory sound, but does not completely mask it; in the stage of hepatization, both sounds are absent.

707. *Dry* crepitation. (*Râle crepitant sec à grosses bulles*, or *craquement* of Laennec.) This is the sound produced by blowing into a dry bladder. It occurs during inspiration in emphysema, and most distinctly in interlobular emphysema.

708. *Rhonchus* and *Sibilus*.—These sounds are indicative of a dry state of the mucous membrane. They generally occur together as *sibilant rhonchus*, which resembles a prolonged whistle, the chirping of birds, or the sound emitted on the separation of two smooth oiled surfaces. The *sonorous* resembles the snore of sleep, the bass note of a violoncello, or the cooing of a pigeon. When intense, it may be perceived by the hand placed on the chest. All these varieties of sound arise from contraction of a portion of bronchial tube, by swelling of the mucous membrane, by pressure of consolidated lung, or by a plug of tenacious mucus, the sibilant rhonchus existing in the smaller, and the sonorous in the larger tubes. A *click* is also sometimes heard, either during inspiration or expiration, from the sudden displacement of a portion of viscid mucus.

709. The *moist* bronchial rhonchus is called the *mucous râle* (*râle muqueux* of Laennec). It is due to the passage of air through tubes containing a fluid, and is the sound caused by blowing through a pipe into soap and water. It is present in pulmonary catarrh, bronchitis, and hæmoptysis; and in all diseases accompanied with much expectoration,

as in the third stage of pneumonia, and in phthisis. The *tracheal* râle is a mere modification of this sound, existing in the trachea when filled with fluid. It has been compared by Laennec to the rolling of a drum at a distance, or the noise of a carriage in a paved street. The *cavernous rhonchus* occurs in empty cavities of the lung, and is extremely rare. It is caused by the bubbling or gurgling of a fluid in a *circumscribed* space, and is, therefore, a sure sign of a cavity in the lungs, which, in ninety-nine cases out of a hundred, is of tuberculous origin.

710. *Vocal Sounds.*—In a healthy chest there is commonly a diffused resonance, most distinct between the scapulæ, in the situation of the bronchial tubes. If we place the hand on the chest in the act of speaking, especially if the voice be a bass, we perceive a vibration, or *fremitus.* If we place the stethoscope over the larynx or trachea, the voice seems to pass through the tube, being much more clearly perceived by the ear applied to the stethoscope than by the other. This is *laryngophony.* A similar sound is heard when the lungs between the bronchial tubes and the walls of the chest are condensed, and especially if the bronchi are at the same time enlarged. This is *bronchophony.* If in the cavity of the pleura, external to a condensed lung, there is a thin layer of fluid, as happens in recent cases of pleurisy, a sound is heard like the bleating of a goat, or the squeaking of Punch. This is *ægophony.* Again, in cases of pulmonary excavation, the sound of the voice passes through the tube to the ear, as it does in laryngophony, and is called *pectoriloquy.* Lastly, when there is a large cavity communicating with the bronchi, containing fluid and filled with air, a sound is produced during respiration, by speaking, or in coughing, which resembles either the falling of a pin into a cup, or that caused by blowing quickly and forcibly into a bottle with a narrow neck. The first is called *metallic tinkling*, the second *amphoric resonance* or *buzzing.* These sounds are heard most distinctly in pneumothorax; but they also occur in large abscesses of the lungs. In very rare cases of pneumothorax this metallic tinkling has been produced by each beat of the heart.

711. There is one sound, which, though due to an external cause may be confounded by the beginner with sounds originating within the chest —the *muscular sound* (bruit musculaire). It is due to muscular contraction, and is very distinct in patients shivering with cold, or in whom the muscles are put on the stretch. When the neck and shoulders are forcibly thrown back, the hands forcibly raised above the head, or the arms strongly folded across the chest, this sound is very distinct. It is an extremely rapid vibrating sound, bearing a close resemblance, when strongly marked, to the distant rumbling of carriages over a paved street. The pupil should make himself familiar with it, by placing his ear on the pillow, and contracting the muscles of the jaw with different degrees of force and quickness, taking care, at the same time, to avoid grating the teeth. When he closes the jaw gently, he will hear the rapid vibration just mentioned; a stronger contraction will render the vibration more rapid; a strong and abrupt contraction closely imitates the firs sound of the heart; a still stronger and quicker one produces a sound

which might be confounded with the "bruit de soufflet," and the strongest and most abrupt contraction causes a species of cooing sound. The ear applied to the biceps muscle during strong contraction, or to the abdominal muscles during a violent and abrupt expiratory effort, perceives a sound not easily distinguished from the first sound of the heart. The continuity of the "bruit musculaire" distinguishes it at once from all the respiratory and vocal sounds.

712. It only remains to mention two sounds which have their source external to the lungs, in the sac of the pleura. The one is a *friction* or *to-and-fro* sound, occurring both in inspiration and expiration when the pleuræ are dry and rough with deposits; the other a *splashing* sound, distinctly heard by the ear applied to the chest, when there is a mixed collection of air and fluid in the pleural cavity, and a sudden jerk (*succussion*) is given to the chest. This sound is sometimes heard in very large tuberculous cavities.

713. The young auscultator may consult with advantage the following table, which presents at one view the chief points just stated.

SOUNDS PRODUCED BY THE PASSAGE OF THE AIR IN RESPIRATION.

NATURAL.

Tracheal; in the neck and at the top of the sternum.
Bronchial; near the top of the sternum, and between the scapulæ.
Vesicular; on most other parts of the chest.

MORBID.

Bronchial Respiration; from condensed lung.
Cavernous, *Amphoric;* in cavities communicating with the bronchi.

- Râles and Rhonchi.
  - *Moist.*
    - *Mucous;* liquid in bronchi.
    - *Crepitation;* viscid liquid in small tubes and air-cells.
    - *Gurgling;* liquid in cavity.
  - *Dry.*
    - *Dry crepitation;* in emphysema.
    - *Cavernous rhonchus;* in cavity destitute of fluid.
    - *Sibilant and Sonorous rhonchus.* Contraction of bronchi, by swelling of mucous membrane, pressure, or tenacious secretion.

SOUNDS OF THE VOICE TRANSMITTED THROUGH THE CHEST.

- Healthy.
  - *Laryngophony;* over larynx.
  - *Tracheophony;* over neck and upper part of sternum.
  - *Bronchophony;* near top of sternum, between the scapulæ, &c.
  - (*Fremitus,* or *vocal vibration;* felt by hand in many parts of chest.)
- Morbid.
  - *Bronchophony;* sound of voice through condensed lung.
  - *Ægophony;* the same, vibrating through a thin layer of fluid.
  - *Pectoriloquy;* the same in a cavity of the lungs.
  - *Tinkling, &c.;* a changed echo of voice or cough in a large cavity containing air and liquid.

SOUNDS PRODUCED BY THE MOTIONS OF THE LUNGS.

Friction-sounds, when the pleuræ are dry or rough from deposit.

SOUND PRODUCED BY SUCCUSSION.

A splashing sound, when the cavity of the pleura or a large tuberculous cavity contains fluid mixed with air.

SOUNDS PRODUCED BY THE CONTRACTION OF THE MUSCLES.

Vibratory sounds of varying intensity.

The Heart.

714. The position of the heart and large vessels, with their relation to the walls of the chest, and to the lungs, will be best understood by referring to Figs. 40 and 41. It will be seen that the lungs, which fill so large a part of the chest, leave an irregular space (1 and 2, Fig. 40) in the anterior part of the chest unoccupied. That part of this space (1) which lies behind the upper half of the sternum, is of a nearly uniform width of two inches, the anterior edges of the two lungs being here nearly parallel. The lower portion of this space (2), on the other hand, being formed by the wide separation of the left lung from the right, approaches the triangular form. The upper part of this space corresponds to the large vessels, the lower to the heart. This space, however, does not represent the size and shape of the heart and large vessels, but merely of such portions of them as are not concealed from view by the thin edges of the lungs; nor can the heart and large vessels be fully seen until the pericardium has been opened, the cellular membrane connected with it dissected away, and the lungs turned aside to the right and left. Posteriorly (Fig. 38), the inner edges of the two lungs are nearly parallel, leaving a centre space (1 and 2) about two inches wide, occupied by the trachea and œsophagus above, and by the œsophagus and descending aorta below. In consequence of the great thickness of the spine and muscles of the back, this space is not favourable to stethoscopic examination.

715. The pericardium, which surrounds the heart, is firmly attached above to the large vessels connected with its base, and to the diaphragm below; so that the heart beats within this fibro-serous sac, subject to be pulled down with it when the diaphragm descends in inspiration, and to be raised with it when the diaphragm moves upwards in expiration.

716. But as the large vessels, firmly bound to each other and to surrounding parts, spring from the base of the heart, and as the short ascending cava connects this part with the tendinous portion of the diaphragm, it is not subject, in healthy persons, to any material alteration of position.

717. The large vessels, therefore, form a sort of fixed point on which the heart moves. From this point it is tilted and twisted forward

during the contraction of the ventricles; towards this point it is raised with the diaphragm, during expiration; and from this point it is pulled downwards during inspiration. These changes of place are exaggerated by the ribs moving in opposite directions to the diaphragm.

718. The change of place due to inspiration and expiration is so great, that, during a deep inspiration, the apex of the heart, instead of beating in the fifth intercostal space, may be felt in the sixth, but indistinctly, from the lung being drawn in front of it. By a forced expiration, on the other hand, the ribs are drawn down and brought closer into contact with the heart, so that it may be felt beating in the fourth intercostal space, and even as high as the third rib.

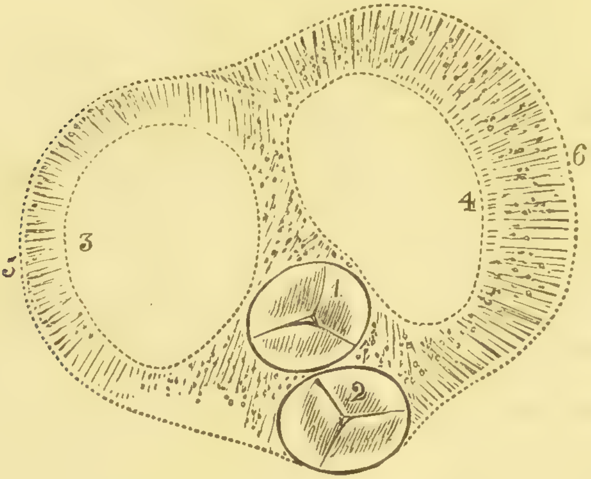
719. The same act of inspiration which depresses the diaphragm and tilts the ribs outwards expands the lungs, so that their anterior edges slide over the pericardium; and the same act of expiration which forces the diaphragm upwards, and pulls the ribs downwards, causes the lungs to collapse, and their anterior edges to slide back again, thus leaving more of the pericardium exposed. A distended stomach, or a general enlargement of the abdomen, has the same effect on the position of the heart as an act of expiration.

720. In consequence of the free motion which the heart enjoys, it is affected by the posture of the body, receding a little from the anterior walls of the chest when we lie on the back, and moving somewhat to the right or left, as we lie on the sides.

721. The heart, then, occupies an oblique position within the chest, so that, when we stand or sit, the base, fixed by the attachments of the large vessels, is directed upwards, backwards, and to the right; the apex downwards, forwards, and to the left; the base separated from the fifth, sixth, and seventh dorsal vertebræ by the descending aorta and œsophagus; the apex, when the ventricles are contracted, and the respiration tranquil, corresponding to the space between the fifth and sixth ribs—a point about two inches below, and one inch to the inside of the left nipple, or two inches and a half from the left border of the base of the ensiform cartilage. One half the heart, consisting of a small part of the left auricle and the whole of the left ventricle, and the left vertical half of the right ventricle, lies to the left of the sternum, behind the cartilages of the fourth and fifth, and the sternal articulations of the fifth, sixth, and seventh ribs, and the fourth, fifth, and sixth intercostal spaces: the other half of the organ, consisting of nearly all the rest of the right ventricle, lies behind the lower half of the sternum, a small part only of the ventricle and the right auricle being behind the sternal articulations of the third, fourth, and fifth ribs, and the fourth and fifth right intercostal spaces. The flat under and posterior surface of the left ventricle lies upon the diaphragm, which separates it from the left lobe of the liver; the rounded right ventricle is turned upwards and forwards, separated from the sternum and thin anterior edges of the lungs by the pericardium and loose cellular membrane connected with it.

722. The orifices and valves, which are the seat of the sounds heard on applying the ear or the stethoscope over the heart, are very close to each other, the orifice of the aorta (1, Fig. 44) lying directly behind that of the pulmonary artery (2), while the right and left auriculo-ventricular orifices (3 and 4) are only a third of an inch apart, and just below those of the arteries. The diagram (Fig. 44) shows, in horizontal section, both the relative positions of the valves and the relative thickness of the walls of the right ventricle (5) and left ventricle (6).

Fig. 44.



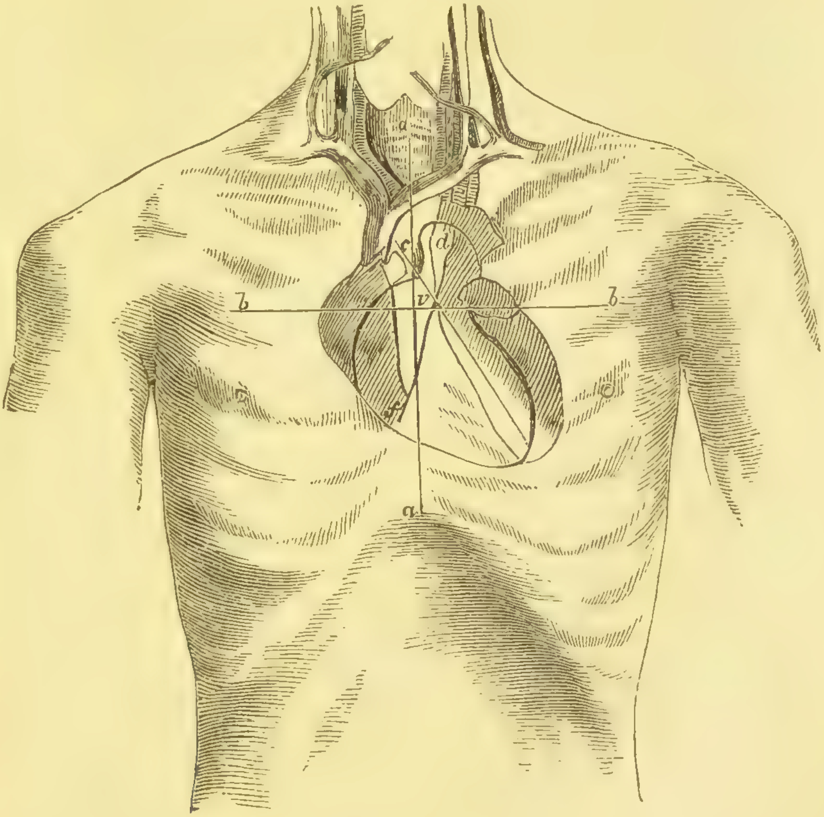
723. The position of these valves in the healthy subject, relatively to the bones and walls of the chest, has been determined by transfixing them with needles. It has been thus ascertained that, in the recumbent posture, the bulging part of the pulmonary artery corresponds to the space between the second and third ribs of the left side, close to the sternum; so that a line, *b b*, Fig. 45, drawn across the sternum to the lower margin of the third ribs, passes over the valves of the pulmonary artery, a little to the left of the mesial line (at *v*), and about half an inch above the valves of the aorta, which lie (in the erect position of the body) behind the pulmonic valves. The auriculo-ventricular orifices are, in like manner, found to correspond to a line drawn across the sternum at a somewhat lower level in the interspace of the third and fourth ribs, the valves themselves being situate somewhat to the right and left of those of the aorta and pulmonary artery respectively.

724. As a knowledge of the exact relation of the heart, and of its several parts, to the bones and walls of the chest is very conducive to a sound diagnosis of its diseases, the facts already stated will be briefly recapitulated, reference being made to the annexed engraving.

725. 1. *Parts of the Heart and Large Vessels not covered by the*

Lungs, and separated from the walls of the Chest only by the Pericardium and loose Cellular Tissue.—The root of the pulmonary artery; the ascending aorta; the anterior surface of the right ventricle; a small portion of the appendix of the right auricle, with the apex and anterior margin of the left ventricle. See 1 and 2, Fig. 40, and the unshaded portion of the heart in Fig. 45.

Fig. 45.



2. *Pulmonary Artery.*—Close to the sternum, in the interspace of the second and third ribs of the left side.

3. *Aorta.*—The ascending aorta lies behind the mesian line of the sternum; it makes its first bend behind the manubrium, and is then directed obliquely backwards and to the left, forming the arch, the crown of which is on a level with the first intercostal space. The descending aorta commences on the left of the third dorsal vertebra.

4. *Valves of the Pulmonary Artery and Aorta.*—The first of these is situate immediately to the left of the intersection of a line, *b b*, drawn across the sternum to the inferior margins of the third ribs, with the mesial line, *a a*. The latter lie immediately behind those of the pulmonary artery on a level with the body of the fifth dorsal vertebra.

5. *Auriculo-Ventricular Valves.*—To the right and left of the valves

of the aorta and pulmonary artery respectively, about a third of an inch apart, the tricuspid being somewhat lower than the mitral.

6. *Apex of the Heart.*—When the body is erect and the breathing tranquil, this is felt beating between the fifth and sixth ribs of the left side, an inch and a half below, and an inch to the inside of the left nipple.

726. In examining the heart, three points demand attention—its *position and size*, its *motions*, its *sounds*.

727. *Position and Size of the Heart.*—These are determined chiefly by percussion, and, in some cases, though with less accuracy, by the touch. In healthy and well-formed persons a dull sound is elicited by percussion over an area of about two inches in diameter, extending from the point where the heart's beat is felt to the left side of the lower half of the sternum. This space, which corresponds to the part of the heart uncovered by the lungs, yields a dull sound, both on strong and slight percussion. Beyond this space the sound is gradually softened off, in proportion as the thickness of the overlapping lung increases; but on strong and sharp percussion, the dull sound is heard through the intervening portion of lung. When the heart is enlarged, or the pericardium filled with fluid, the region of dulness is increased. The same effect is produced by consolidation of the surrounding lung, by tumours between the pericardium and walls of the chest, by partial pleuritic effusions confined by false membranes, or even by enlargement of the left lobe of the liver. It is only in the ascertained absence of such diseased conditions that the extent of dulness on percussion may be taken as the measure of the heart's size. (See Figs. 38 and 39, in which the area of dulness in health and its extension in disease are compared.)

728. On the other hand, the absence of dulness on percussion does not afford certain evidence of non-enlargement of the heart; for emphysema of the lung, pneumothorax, or even distension of the stomach with gas, may give rise to so clear a sound on percussion as to mask the heart-affection. The dulness also ceases, even in healthy persons, on lying down, or taking a deep breath. The persistence of a dull sound under these circumstances affords evidence either of adhesions of the heart or lungs, or of such an enlargement of the heart, or distension of the pericardium, as prevents the heart from receding.

729. *Motions of the Heart.*—The auricles and ventricles contract alternately, the systole of the one being synchronous with the diastole of the other. The auricles first contract, then the ventricles. The contraction of the ventricles is followed by their diastole, and this by a short pause. During the diastole of the ventricles, and the short pause that succeeds, the blood flows from the auricles into the ventricles, and the contraction of the auricular appendices which immediately succeeds the pause excites the ventricles to new contraction. The order, therefore (or *rhythm*), of the heart's movements is as follows:—systole of ventricles, diastole of ventricles, systole of auricles, pause. Of the *whole* time consumed, the systole of the auricles and the systole of the ventricles occupies one-half, the diastole of the ventricles a fourth, and the pause a fourth.

730. The impulse of the heart is synchronous with the contraction of the ventricles and the pulse in the large arteries. It was formerly attributed to the tilting of the apex against the ribs, but it is now understood to depend on the sudden change of shape and rigid contraction which the heart undergoes—the anterior surface bulging through its entire length. The effect of this sudden bulging of the rigid walls of the ventricles is felt chiefly at the apex; for a thick mass of spongy lung absorbs and neutralises the force of the impulse over the rest of the heart's surface. A full expiration, by lessening the intervening portion of lung, extends the limits of the impulse; and the same result follows when the body is bent forward.

731. The strength of the impulse, and the extent of surface over which it is felt, vary greatly in disease. When the walls of the heart are thickened at the expense of its cavities (concentric hypertrophy), the impulse is little increased in extent, but greatly augmented in force; but when the walls are thin and the cavities large, the impulse is of less force, but greater extent. If thickening of the walls is accompanied by increased size of the cavities (in which case the heart will be greatly enlarged), the impulse is both stronger and more extensive, and may be felt over a space of five or six square inches.

732. Fluid in the pericardium renders the impulse indistinct, and its place variable. Adhesions of the heart and pericardium, on the contrary, confine the impulse to the same spot, so that change of posture, and the different states of the walls of the chest in inspiration and expiration, have little or no effect upon it. Tumours within the chest and diseases of the lungs may displace the heart, and shift the spot in which its impulse is felt. Congenital transposition of the heart has the same effect. The impulse will be more distinctly felt, *cæteris paribus*, when the contraction of the ventricle is abrupt.

733. When the heart beats strongly, and especially in emaciated subjects, its movements may be seen as well as felt, and their force, extent, and nature furnish useful indications. When the heart is enlarged, these movements are perceptible in the epigastric region.

734. The heart is also subject to irregularities of action; such as double and triple impulse, depending generally on spasmodic and partial contraction of the ventricles, and on irregular transmission of blood from the auricles; to intermittence, inequality, and increased or diminished force. As these produce appreciable changes in the pulse, they will be considered under that head.

735. *Sounds of the Heart.*—The natural sounds of the heart are two—a dull, prolonged sound, synchronous with the contraction of the ventricles, the heart's impulse, and the pulse in the larger arteries; and an abrupt, clear sound immediately succeeding the first, and followed by a silent interval. The first sound is loudest over the middle of the ventricles, the last over the site of the semilunar valves, and for a short distance upwards along the sternum. They are most distinct when the pulse is slow, and are more clear in thin than in stout persons. We

may hear them in our own persons when lying on the left side; and in disease they may sometimes be heard at a short distance from the patient. The intensity of the sound diminishes as the distance from the præcordia increases.

736. In stout persons, the sounds are limited to the region of the heart itself; in narrow-chested persons, and in children, they may be heard all over the chest, before as well as behind. Any cause which increases the conducting power of the contents of the chest, such as consolidation of the lungs in pneumonia and phthisis extends the limits within which the sounds are audible. When consolidation is confined to the right side, the sounds of the heart are heard more distinctly on that side, both before and behind, than on the left.

737. *Cause of the Sounds.*—The dull, heavy, prolonged first sound is caused by the contraction of the ventricles and their musculi papillares, stretching the cordæ tendineæ and the membranous valves (tricuspid and bicuspid) into which they are inserted. The second sound is owing to the sudden expansion and flapping together of the semilunar valves.

738. The sounds of the heart may be changed in intensity or in kind. An increased loudness of sound is often heard during nervous palpitations, both by the patient himself and by his attendants; it may also be produced by dilatation of the ventricles, with thinness of their parietes. In the former case, the impulse is increased: in the latter, diminished. On the other hand, the sounds may be so feeble as to be heard with difficulty; as happens in general debility, in obstructed pulmonary circulation, when the heart is overloaded with blood, in softening of its fibres, and in excessive hypertrophy. In the latter case, there will be strong impulse with weak sounds.

739. In cases of nervous palpitation, and after strong exercise, both sounds of the heart are unusually distinct; the action of the fibres being strong and abrupt, and the valves of the aorta closing with a sudden jerk: hence the loudness of the first sound and the abruptness of the second.

740. Of the sounds present in unusual or diseased conditions of the circulation some belong to the heart, others to the blood-vessels. They are the following:—The *bellows sound* (bruit de soufflet), the *simple blowing sound*, the *hissing sound*, the *sawing sound* (bruit de scie), the *rasping sound* (bruit de râpe), a *humming sound* (bruit de diable), a *buzzing sound* (bruit de mouche), a *whizzing sound*, and peculiar musical sounds, such as cooing, whistling, &c.

741. The sounds heard over the region of the heart, or in the large vessels that spring from it, are chiefly the bellows sound and its modifications—the sawing or rasping sound, and the musical sounds.

742. The *bellows* sound is always produced when there is a marked disproportion between the force of the heart's contractions and the size

of the tubes or orifices through which the blood has to pass. It may arise—1. In healthy persons, during very strong contraction of the heart, the arteries retaining their normal size; in nervous persons, during violent palpitations, the heart contracting both quickly and forcibly; in chlorotic females, from, as is thought, a thin condition of the blood; and in cases of great debility from sudden hæmorrhage. In these cases the sound is not constant. When present, it bears a close resemblance to the panting noise of a locomotive starting on its journey. 2. From narrowing of the orifices, the heart contracting as usual or with increased force: as when the orifice of the aorta or pulmonary artery is contracted, with or without enlargement and hypertrophy of the corresponding ventricle. 3. From narrowing of the orifices by vegetations, incrustations, or polypous concretions of the valves. 4. From adhesion of the aortic or auriculo-ventricular valves to the adjacent walls.

743. The young stethoscopist must be guarded against confounding a rapid tubular respiration with a *bruit de soufflet.* When the true cause of the sound is doubtful, the patient must be made to hold his breath.

The place in which abnormal sounds are heard, and the sound of the heart which they accompany, often enable us to fix on their precise seat and cause. Thus, sounds heard only in the region of the heart or over the valves, and becoming indistinct when the ear follows the course of the aorta, but increasing in distinctness as the ear approaches the apex of the heart, may be ascribed to disease of the auriculo-ventricular valves; or to causes external to the heart itself, and having the pericardium for their seat. On the other hand, sounds heard in the site of the valves, and remaining equally distinct or increasing in distinctness, as the ear follows the course of the large vessels, may be referred to diseases of the coats or valves of the aorta or pulmonary artery. Of the two auriculo-ventricular valves, the mitral is the most likely seat of disease. Of the two arteries and their valves, the coats and valves of the aorta are the most liable to structural disease.

744. If the abnormal sounds accompany the first beat of the heart, they are probably due to disease of the auriculo-ventricular orifices, or of the valves or coats of the arteries. When they accompany the second sound, they probably arise from disease of the aortic valves. Double sounds may be due to disease of the auriculo-ventricular valves coinciding with disease of the valves of the aorta or pulmonary artery; or to disease of the coats and valves of the aorta.

745. A more exact diagnosis of the causes of abnormal valvular sounds may be arrived at by considering together the position of the valves and the direction in which the sounds are most readily conducted. In the case of the tricuspid the valvular sound conducted by the walls of the right ventricle would be most distinctly perceived on the right side, and towards the base of the heart; while abnormal sounds due to disease of the mitral valve would be most distinctly heard on the left side, and towards the apex. So also with abnormal sounds due to disease of the two great arteries. As their coats will be the best conductors of the sounds produced at the roots of the arteries themselves,

or in any part of their course, the sounds will continue distinctly audible along the track of the respective vessels, but become less and less distinct as the ear travels in a direction from the base to the apex of the heart. Aortic murmurs, therefore, will continue distinct behind the middle of the sternum, and in the direction of the right sub-clavicular space; while pulmonic murmurs, becoming indistinct in that direction, will be best heard at the left of the sternum, between the second and third ribs, and will continue distinct in the track of the left pulmonary artery, or for a short distance in the direction of the left sub-clavicular space.

746. The following diagnosis of valvular sounds is in accordance with these statements.

1. A murmur with the *first* sound of the heart heard over the site of the semilunar valves, and distinct at *c* (Fig. 45, p. 165), is *aortic*.

2. A murmur with the *first* sound heard in the same situation, but distinct at *d*, is *pulmonic*.

3. A prolonged murmur with the *second* sound, loudest over the semilunar valves, is due to regurgitation through those valves,—of the aorta, if the sound is loudest in the direction *c e;* of the pulmonary artery, if loudest in the direction *d f;* but in either case becoming less intense, as the ear travels towards the apex of the heart.

4. A murmur with the *first* sound, loudest at *f*, is from tricuspid regurgitation.

5. A murmur with the *first* sound, loudest at *e*, is from mitral regurgitation.

6. A murmur with the *second* sound, loudest at *e*, is from contraction of the mitral; if loudest at *f*, from contraction of the tricuspid.

Lastly, as a general rule, a murmur with either sound distinct at *c* and *d* is semilunar; if distinct at *e* and *f*, it is auricular.

747. The indication afforded by abnormal sounds over the heart and large vessels may often be confirmed or corrected by placing the hand on the wrist, while the ear is applied to the seat of the sounds. In the case of abnormal sounds attributed to disease of the auriculo-ventricular valves, if the sound precede the pulse, we may attribute it to the entry of the blood into the ventricle; if it be synchronous with it, to reflux. In this latter case, the presence of the venous pulse, that is to say, the pulsation of the large veins on the right side of the neck caused by regurgitation into them, indicates that the right side of the heart is affected. These indications may also be confirmed or corrected by attending to such leading symptoms as the pulse and respiration, and the presence of hæmorrhages and dropsical effusions. For instance, an irregular, unequal, and feeble pulse is common in disease of the mitral valve, but a full, hard, regular, thrilling pulse in disease of the aorta. Dropsies are more common in disease of the right side of the heart, affections of the lungs in disease of the left side, and head symptoms in disease of the aorta.

748. The sounds heard in the region of the heart, from causes external

to it, are superficial friction sounds, generally double, and in rare cases triple or fourfold. They arise from deposits of coagulable lymph on the pericardium, or from other morbid formations in the same situation. They are of limited extent, and are not heard in the course of the large vessels. They resemble those produced by depositions of lymph on the pleura, and vary in intensity, from a sound closely allied to the *bruit de soufflet*, to the harsh sound produced by sawing wood.

749. The hand applied to the spot where an abnormal sound is heard perceives a peculiar *thrilling vibratory motion*, like that felt on touching the back of a cat in the act of purring. This is called the purring tremor (*frémissement cataire*). A similar thrill is sometimes felt under strong pressure in the healthy arteries themselves, after profuse loss of blood, and in anæmia. It is also present over aneurismal tumours, in aortic dilatations, in arterial varix, and in regurgitant valvular disease.

750. The most common sound in the vessels remote from the heart is the bellows murmur. This may always be produced, both in arteries and veins, by the firm pressure of the stethoscope, but is most distinctly heard in chlorotic females, and after hæmorrhages. It is heard in the veins of the uterus during pregnancy, but may be produced by pressure of the stethoscope transmitted to the iliac veins, or aorta.

751. The humming sound (*bruit de diable*) and the buzzing sound (*bruit de mouche*) are also heard in different states of the vessels, and in the large veins under the pressure of the stethoscope. They may be heard in most anæmic females by placing the stethoscope with a firm pressure in the supra-clavicular space; but they are not peculiar to anæmia. They are generally most distinct on the left side, but, in rare instances, are perceptible only on the right side or only on the left.

752. This humming or buzzing sound is distinguished from sounds due to the motion of the blood in the arteries by being continuous. Sometimes, as in extreme cases of anæmia, a humming sound, due to the motion of the blood through the veins, is heard at the same time with a bellows sound caused by the motion of the blood through the arteries. This combination is best heard above the clavicles.

753. The peculiar whizzing or grating sound of aneurism, and of aneurismal varix (an accidental opening from an artery into a vein), completes the history of valvular sounds.

4. THE PULSE.

754. By the ear or hand applied to the region of the heart, we count the number, force, quickness, regularity, and degree of equality of its beats; but the pulse teaches us this and something more. It is a measure not only of the number, force, quickness, regularity, and degree of equality of the heart's contractions, but also of the quantity of blood sent forth at each beat. Hence it is a better measure of the circulation. It would be a perfect one were it not that the coats of the arteries vary in their contractility. But this circumstance gives the pulse an additional

claim to attention; for it serves as an index of the state of the nervous system; by which the contractility of the arteries is determined.

755. The fallaciousness of the pulse has passed into a proverb, and the proverb has furnished a good excuse for neglect. Substitute the word "difficult" for the word "fallacious," and we have a motive for industry instead of an apology for idleness. The pulse can only be fallacious to the extent to which we are ignorant of it; it will always remain difficult even to those who understand it best. The difficulties that attach to the subject are the same which beset every part of the study and practice of medicine, and they spring from the same causes—of which the chief are the original difference in degree existing between all the functions of the healthy body, the variable intensity of the causes of disease, and the many combinations of which those causes are susceptible.

756. Some precautions are necessary in examining the pulse and some directions are required. The first precaution to be observed is, to wait a certain time till the emotions commonly occasioned by the presence of the medical attendant have subsided, for such emotions have a marked effect on the circulation. For the purpose of counting the number of beats, a single finger may be used; but in order to observe the more minute changes of the pulse, the four fingers of the opposite hand should be applied in the course of the radial artery, with a moderately firm and equal pressure. By compressing the artery with the ring or little finger, we can ascertain by the forefinger the degree of compressibility. In infants and very young children, it is often difficult to count the pulse at the wrist, and in these cases the beat of the heart should be preferred. The pulse of infants should, if possible, be counted while they are asleep.

757. Of all the characters of the pulse, its frequency is the one most easily ascertained. This usually corresponds with the number of the heart's contractions: it can never exceed that number, though it may fall short of it. In certain forms of heart disease, the ventricles receive so small a quantity of blood that no impression is made on the mass of the circulating fluid, and the impulse does not reach the radial artery: or the heart contracts without having any blood in it; or some pressure, temporary or permanent, exists in the course of the artery: in all these cases, the pulse is imperceptible, and we miss some of its beats. In syncope, all the beats of the heart are so feeble that no pulse can be felt at the wrist.

758. The number of the pulse in health varies with age, sex, and temperament; with posture, time of day, sleep, exercise, food; with mental emotions; with temperature and density of the air; with the quantity of blood in the body; and with the strength and vigour. Our principal information on this subject is condensed in the following pages:—

759. AGE.—*Infancy.*—The number of the pulse is very variable in infants. In the healthy infant asleep on the day of its birth, Heberden found it to be between 130 and 140; and, according to Quetelet, the numbers immediately after birth, both for males and females, are as follow:—

Maximum, 165; Minimum, 104; Mean, 135; Range, 61.

The following numbers are from Billard; the averages are approximations:—

	Max.	Min.	Mean.	Range.
1 to 10 days	180;	less than 80 (in 18)	106;	more than 100
1 to 2 months	150;	70	103;	80
1 to 3 months	100;	70	87;	30

The pulse of the infant at birth, and for some time after, is, therefore, very variable, and is little to be depended on as an indication of health.

760. From infancy till towards the middle of life, the number of the pulse progressively diminishes, to increase again slightly in the decline of life. The following table, founded on an aggregate of about 700 observations, of which the greater number were made by myself, shows, for the first 25 years of life, the average and extreme numbers of the pulse, without distinction of sex, time of day, or posture of the body. The table shows an uninterrupted fall from 128 to 90, in the first seven years of life, and a further fall (with irregularities due to the small number of observations) during the 18 years which follow: also a range, for the whole period of 25 years, varying from 56 to 29, and displaying a progressive decrease with fluctuations dependent on the same cause.

Age.	Max.	Min.	Mean.	Range.
1	158	108	128	50
2	136	84	107	52
3	124	84	106	40
4	124	80	105	44
5	133	80	101	53
6	124	70	95	54
7	128	72	90	56
8	112	72	92	40
9	114	65	87	49
10	120	76	91	44
11	100	56	84	44
12	120	70	94	50
13	112	70	84	42
14	114	68	86	46
15	112	60	84	52
16	104	66	83	38
17	102	54	76	48
18	104	58	74	46
19	108	60	76	48
20	106	52	72	54
21	99	59	74	40
22	96	41	68	55
23	100	60	74	40
24	84	52	71	32
25	88	59	73	29

761. The following table shows the number of the pulse at different ages, based on twenty-five observations at each age, all of which obser-

vations were made in apparently healthy persons, fasting, at rest, in the middle of the day, and in a sitting posture:—

Age.	Males.				Females.			
	Max.	Min.	Mean.	Range.	Max.	Min.	Mean.	Range.
1 week,	160	104	128	56	160	104	128	56
2 to 7 years	128	72	97	56	128	70	98	58
7—14	108	70	84	38	120	70	94	50
14—21	108	60	76	48	124	56	82	68
21—28	100	53	73	47	114	54	80	60
28—35	92	56	70	36	94	62	78	32
35—42	90	48	68	42	100	56	78	44
42—49	96	50	70	46	106	64	77	42
49—56	92	46	67	46	96	64	76	32
56—63	84	56	68	28	108	60	77	48
63—70	96	54	70	42	100	52	78	48
70—77	94	54	67	40	104	54	81	50
77—84	97	50	71	47	105	64	82	41

762. The pulse of the adult male, then, may be stated at 70, that of the adult female at 80; the highest number is somewhat less than 100 in the male, and somewhat more than 110 in the female; the least number in each is about 50. The range (difference between the highest and lowest numbers) extends from 28 to 56 in the male, average 43; and from 32 to 68 in the female, average 48. The lowest number in the table is 46; the lowest observed by Floyer, was 55.

763. Much lower numbers have, however, been met with in healthy persons. Heberden records, 42, 30, and even 26 beats in a man whose "chief distemper" was the age of fourscore; and Fordyce, 26, in an old man in the Charter-house. In a young man whose pulse is not included in the table (he then suffered from slight dyspepsia, and has since died of consumption), I have repeatedly counted as low as 38 beats; and in a medical man who had been reduced to extreme weakness by a succession of exhausting maladies, and slowly recovered health and strength, I have counted as few as 30 beats; which, or a near approach to it, continues to be the usual number at an interval of some years from the date of his recovery. Pulses as low as 16 or even 14 are on record, but it is doubtful whether the persons in whom they occurred were healthy. Falconer has observed pulses of 36 and 24 in women, and Dr. Graves one of 38.

764. In disease, extraordinarily small numbers have been counted; one case is reported by M. Piorry, in which there were 17 beats in a minute; in a case of epilepsy (Sir W. Burnett) the number was 14; Heberden was told of a pulse of 12 or 16; and in a remarkable case of

injury to the upper part of the spine, followed after an interval by fits of syncope with convulsions, the pulse was usually about 33, but fell during the fits to 12, 10, 8, "and at three or four different times, when the patient was quite insensible, and not in a fit," 7½ in a minute. (Mr. Holberton, in Med.-Chir. Trans. 1841.) These low frequencies of pulse are generally little affected by stimuli, and, as in the case reported by Dr. Graves, remain unaltered by febrile attacks.

The pulse often falls very low during convalescence from fevers and other exhausting maladies; and a very infrequent pulse has been specially noted among the anomalous symptoms of diphtheria.

765. It is probable, on the other hand, that there are exceptions of an opposite kind—that is, cases of great frequency of pulse; but I have not met with any well-authenticated instances. In disease, very high numbers have been encountered. Dr. Joy counted 200 in a case of acute hydrocephalus, and I was informed by a medical man, that during occasional violent fits of palpitation he counted in his own person 250 beats in the minute, and that a medical friend corroborated his statement as to the number. Heberden met with a pulse of 180, though Floyer thought that the greatest number which could be counted was 140. I have myself counted upwards of 170 in pulmonary consumption; and during the rapid formation of diffused abscess of the arm, in a boy ten years of age suffering from a fatal attack of typhoid fever, I distinctly counted 264 beats in the minute, being nearly nine in two seconds.

766. *Sex.*—On comparing the two columns of the last table, it will be seen that the pulse of the female has nearly the same number as that of the male up to seven years, but that at more advanced periods of life the female pulse is in excess by from 6 to 14 beats, the average excess being 9. The pulse, too, has a greater range in the female; that is to say, there is a greater difference between its highest and lowest numbers; the female pulse being often much more frequent than the male, while in other instances it falls nearly as low.

767. As it is not easy to bear in mind the number of the pulse in the two sexes for the several periods specified in the tables, the following approximate figures may assist the memory:—

1. At birth	140
2. Infancy	120
3. Childhood	100
4. Youth	90
5. Adult Age	75
6. Old Age	70
7. Decrepitude	75–80

An addition of about 10 beats will have to be made to 4, 5, and 6, in order to give the numbers in the female.

768. *Temperament.*—Nothing is certainly known of the influence of

temperament on the pulse. It is probably more frequent in the sanguine and nervous than in the lymphatic and bilious; but I have counted a pulse of 50 in a youth under 20 years of age, with every mark of the sanguine temperament.

769. *Posture.*—In the healthy adult male the mean frequency of the pulse in the different postures is as follows:—

Standing, 79; sitting, 70; lying, 67; including all exceptions to the rule.
Standing, 81; sitting, 71; lying, 66; excluding all exceptions.
In the adult female of the same mean age the numbers are—
Standing, 89; sitting, 82; lying, 80; including all exceptions.
Standing, 91; sitting, 84; lying, 80; excluding all exceptions.

770. The extremes are very remote from these mean numbers. Thus, in men, the difference between standing and sitting has been observed as high as 26, and as low as 0; that between sitting and lying as high as 18, and as low as 0; and that between standing and lying as high as 44, and as low as 0. In women, differences scarcely less marked have been observed. Numerous exceptions also exist to the rule that the pulse is more frequent sitting than lying, and standing than sitting. The effect of change of posture on the same number of the pulse is nearly twice as great in males as in females, and nearly three times as great in adults as in early youth.

771. The effect of change of posture increases with the frequency of the pulse, as is seen in the following tables:—

MALES.

	51–70	71–90	91–110	111–130
Standing . . .	61	81	101	120
Sitting	55	68	82	93
Lying	52	67	74	81
Difference between standing and lying	9	14	27	39

FEMALES.

	61–80	81–100	101–120
Standing . . .	71	92	108
Sitting	67	85	97
Lying	63	83	90
Difference between standing and lying	8	9	18

772. The exceptions to the general rule decrease as the frequency of the pulse increases, and for the higher numbers entirely disappear. The effect of change of posture on the same number is greater in the morning than in the evening. When the head is placed lower than the body the pulse falls.

773. The number of the pulse in the different postures is determined by the muscular effort required to support the body in those postures.

774. The effect of change of position is much increased by debility, but diminished in phthisis pulmonalis, and, according to Dr. Graves, is reduced to zero in hypertrophy of the heart.

775. *Period of the Day.*—The pulse of the healthy male is, as a general rule, more frequent morning than evening, and diminishes progressively as the day advances. To this rule there are many exceptions in men, and still more in women. The fall is also more rapid and uniform in the evening than in the morning. It is also a general rule that all exciting causes act more powerfully on the pulse in the morning than in the evening.

776. In experiments on the pulse in my own person, I found that the effect of the same food on the same number of the pulse was, taking one experiment with another, nearly twice as great, and lasted more than three times as long, in the morning; while in more than one instance the same food which in the morning raised the pulse from 5 to 12 beats, and kept it raised for one or two hours, had no effect whatever in the evening.

777. *Sleep.*—The pulse falls considerably in sleep. Quetelet found a difference of 10 beats in an adult female, the same difference in a girl from three to four years old, and in a boy from four to five years a difference of 16 beats. Sleeplessness excites the circulation.

778. *Exercise.*—This excites the pulse more than any other cause. It may raise it to more than three times its natural number. Change of posture is but a particular case of this. After severe and continued exertion, as I have shown experimentally, the pulse suffers the same collapse as the other functions, and falls much below its natural number. Passive exercise also excites the pulse.

779. *Food.*—The pulse is little affected by vegetable food, more by animal substances, most of all by warm drinks. Spirituous liquors and tobacco, even though used habitually, raise it; cold liquids lower it.

780. *Mental Emotions.*—These have a marked effect on the pulse, the exciting passions raising it, the depressing passions lowering it. The apprehension which patients feel in the presence of their physician is well known to excite the pulse, and the caution not to count it till the excitement has ceased is as old as Celsus.

781. *Temperature of the Air.*—Cold air lowers the pulse, warm air raises it. When Sir C. Blagden remained eight minutes in air heated to 260°, the pulse rose to 144, double its natural number.

782. *Density of the Air.*—On the summit of Mont Blanc, De Saussure found the pulses that beat 49, 66, and 72 times respectively at Chamounix, raised to 98, 112, and 100.

783. *Quantity of Blood in the Body.*—The pulse is more frequent in that degree of plethora which falls short of overloading the heart with blood; its frequency is but little increased when the heart is oppressed. Compression of the arteries raises the pulse by producing the first degree of plethora. A slight decrease in the quantity of blood lowers the pulse; a considerable decrease raises it.

784. *Debility* —In debility without disease the pulse falls: it rises in extreme weakness, or when debility is complicated with irritation.

785. The common causes of increased frequency of pulse in healthy persons, therefore, are the following: Muscular exertion, active and passive exercise, a change from a posture requiring less effort to one requiring more, food (especially warm drinks, spirituous liquors, and tobacco), heat, diminished pressure of air, extreme debility, sleeplessness, the first degree of plethora, and exciting passions and emotions.

786. The chief causes of diminished frequency, on the other hand, are, sleep, fatigue (provided it be not carried to excess), change of posture from one requiring greater effort to one requiring less, the inverted position of the body, continued rest, debility without disease (provided it be not extreme), cold applied externally or taken internally, increased atmospheric pressure, and depressing passions.

787. Other characters of the pulse, besides its frequency, deserve notice. The pulse of healthy men may be described as regular, moderately full, compressible, and rising slowly under the finger; that of healthy women and children as smaller and quicker in the beat. The pulse in the sanguine temperament is full, hard, and quick; in the lymphatic temperament, slower in the beat. In old age the pulse is often rendered hard by the increased firmness of the arteries.

788. Exceptions also occur as to the regularity of the pulse, instances having been observed in which the pulse was irregular or even intermittent in health, and regular in disease, resuming its intermittent character on recovery. Heberden records two cases in which the pulse that was both irregular and unequal in health, became regular during illness. In some persons this irregularity occurs on every slight attack of indigestion, especially where much flatulence is present.

789. The number of the pulse, then, though a point of much importance, is not the only one that demands attention: it has other characters of at least equal value. The following description and explanation of them will be found useful.

790. The impression made on the finger by the pulse is compounded (*a*) of the beat of the heart, (*b*) of the reaction of the aorta and large vessels, (*c*) of the condition of the coats of the artery, (*d*) of the consistence of the blood, and (*e*) of the state of the aortic valves.

791. (*a*) The characters of the pulse which depend upon the degree and mode of the heart's contraction are the following:—

Number of the heart's contractions.—Pulse *frequent*, *infrequent*.

Regularity of the heart's contractions.—Pulse *regular*, *irregular* (intervals unequal), *intermittent* (intervals equal).

Quantity of blood expelled by the heart. Pulse *large* (full), *small*. If the quantity at each beat is the same, the pulse is *equal*; if different, *unequal*.

Time occupied by each beat of the heart.—Pulse *slow* (labouring), *quick* (sharp), *very quick* (jerking or bounding).

792. (*b*) The strong and firm reaction of the healthy elastic coat of the arteries produces a *steady* pulse; the absence of this reaction in the large arterial trunks occasions the peculiar *thrilling* pulse of aortic disease and of aneurism. The following modifications are due to this cause:—

Elasticity of the arteries increased.—Pulse *hard* (strong, sharp, wiry, incompressible).

Elasticity of the arteries diminished.—Pulse *soft* (weak, yielding compressible).

Elasticity lost in the large arterial trunks.—Pulse *jerking*, *thrilling*, *vibrating*.

793. (*c*) The character of the pulse is further modified by the degree of contractility of the muscular fibres which the coats of the smaller arteries contain. This condition may be conveniently expressed by the word *tone*. It exists in every degree from the tense state of high nervous excitement or rude robust health, down to the flabby condition of collapse, shock, or extreme debility.

794. (*d*) The influence which the consistence of the blood has in modifying the pulse is best seen in extreme cases of anæmia, in which an important element being deficient, the pulse assumes the *thrill* that in other cases is due to a loss of elasticity in the arteries.

795. (*e*) The state of the aortic valves has a marked effect on the pulse. In health their prompt closure keeps the arterial system full, and conduces to the steady character of the pulse. But when the valves are so diseased as to prevent their closure, and allow regurgitation into the left ventricle, each pulse is peculiarly distinct, the wave caused by the contraction of the ventricle being felt as if the blood were 'shot under the finger,' the vessel in the interval being unusually empty. This pulse is an exaggeration of the *jerking* pulse of anæmia.

796. The foregoing characters of the pulse are rarely, if ever, met with separate, but admit of various combinations, of which the following are the most important:—

Pulse *frequent*, *large*, *soft*.—(Compounded of a frequent beat of the heart, a large quantity of blood sent out by each contraction, and an artery wanting in elasticity and tone.) This pulse accompanies the premonitory stage of many febrile and exanthematous diseases, such as scarlatina, quinsey, erysipelas, typhus and enteric fever, the first stage of pneumonia, &c. It is also present in dilatation of the left ventricle of the heart.

Pulse *frequent, large, hard.*—(Compounded of a frequent beat of the heart, a large quantity of blood sent out at each beat, and an artery full of elasticity and tone.) The pulse of the first degree of plethora and of hypertrophy with dilatation of the heart.

Pulse *rather frequent, large, slow* (labouring).—Compounded of a rather frequent and slow beat of the heart, and a large quantity of blood sent out at each contraction.) The pulse of a greater degree of plethora, the heart overloaded with blood.

Pulse *frequent, large, hard, quick.*—(Compounded of a frequent and quick beat, a large circulation of blood, and an artery full of elasticity and tone.) The pulse of inflammatory fever.

Pulse *frequent, large, hard, thrilling.*—(Compounded of a frequent beat of the heart, a large quantity of blood sent out at each beat, the artery at the wrist elastic and full of tone, with a loss of elasticity in the larger arterial trunks.) The characteristic pulse of aneurism and of dilated aorta, without obstruction to the flow of blood.

Pulse *frequent, small, quick.*—Compounded of a frequent beat of the heart, a quick contraction, and a small quantity of blood sent out at each beat.) This is the characteristic pulse of phthisis in males, and of anæmia in females. In a moderate degree, indeed, it is the character that marks the female pulse, and is present in an exaggerated form in all the less severe disorders of women. With the addition of extreme hardness it is the pulse of hypertrophy with contraction of the heart.

Pulse *unequal* and *irregular, frequent* or *infrequent.*—(Compounded of a variable quantity of blood sent out at each contraction, and of contractions performed in unequal times.) As the quantity of blood sent forth by the heart may depend upon one of two causes,—diminished supply from the auricle, or want of power in the heart,—this pulse may indicate mitral valve disease, or atrophy or softening of the heart. It may depend, also, on causes which render the supply of blood to the left auricle variable. Hence it occurs in some diseases of the lungs. A similar pulse may occur suddenly as the consequence of the formation of a large polypus in the left ventricle, or from pressure exercised upon the heart by effusion into the pericardium.

Pulse *infrequent, large, hard.*—(Compounded of an infrequent beat of the heart, a full supply of blood, and an artery in a state of elasticity and tone.) A pulse met with in apoplexy before depletion has been practised, in hydrocephalus, in compression of the brain, in narcotism, and in simple hypertrophy of the left ventricle.

Pulse *infrequent, quick.*—(Compounded of an infrequent and a quick beat of the heart.) A pulse sometimes met with in the hysteric female, and in very rare cases of phthisis in the male.

797. These are the leading combinations of the chief elements of the pulse. They are given partly as examples of the use of terms, partly as hints to those who may wish to follow out the study of the pulse.

798. Taken in combination with other symptoms, the pulse furnishes important indications in all diseases; while in pulmonary consumption and diseases of the heart and arteries, it often gives the earliest clue to the existence of an obscure and lurking malady.

799. It must not, however, be supposed that the pulse is free from the uncertainties that attach to all other symptoms of disease. On the contrary, we encounter, from time to time, remarkable exceptions to general rules. There are no characters of the pulse, for instance, more generally present than those just indicated as occurring in pulmonary consumption, especially in men; but among some hundreds of cases conforming to the rule of increased frequency, we meet with a single case in which the number falls short even of the average in health. In one case I counted a pulse of 64 in the erect posture. The dyspeptic patient referred to at § 763, as having a pulse of 38, died several years afterwards of pulmonary consumption. In other diseases and states of system usually characterised by great frequency of pulse, curious exceptions do occasionally take place. Thus, there have been epidemics of continued fever characterised by a very low frequency; and cases of all the more severe febrile disorders marked by the same curious exceptions to the rule. Thus, Dr. Wells counted a pulse of 58 in a boy eight years of age, suffering from anasarca after scarlatina. Of the striking difference of frequency that may exist in two persons suffering from the same disease, Heberden gives a good illustration. Two young women were ill of the same infectious fever, and the pulse of the one was never above 84, while the pulse of the other was counted as high as 180. Both recovered. The low frequency in the first case was thought to be due to the state of the brain, "which was affected comatously."

800. The pulse in disease is also subject to great variations in the same persons, either within short intervals of time, or in states of system in other respects apparently the same. Thus, it is not uncommon in typhus fever to find the pulse varying in a few hours from 40 or 50 beats to 120 or 130; and in a case of phthisis, the pulse, which was 64 in one attack, was 120 in a second, not distinguishable from the first by any other symptom.

Changes in the frequency of the pulse in either direction afford very important indications in disease. Thus, Heberden remarks, "that before some critical swelling or deposit of matter begins to show itself in fevers, the pulse will be so rapid and indistinct as hardly to admit of being counted," a statement confirmed by the case cited in § 765. The same accurate observer tells us that if, in an illness, a pulse of feverish quickness all at once becomes quiet, while all the other bad signs are aggravated, we are to suspect a translation of the diseased condition to the brain, and to apprehend apoplexy, palsy, or death: and, again, that if the pulse of a child be 15 or 20 below the healthy standard, with signs of considerable illness, the brain is certainly affected.

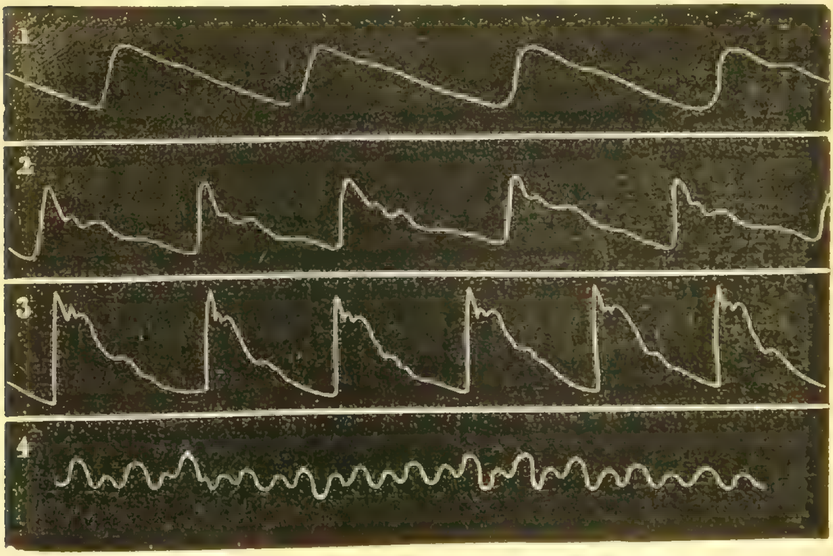
801. Besides the simple characters of the pulse already described, others less common and more obscure have been mentioned by authors,

of which the following are examples:—The redoubled pulse (*dicrotus, bisferiens, bisiliens*), when two strokes follow each other rapidly, and are separated from the two succeeding ones by a pause—a pulse said to indicate approaching hæmorrhage; the *incident* pulse (*incidens, incidaus*), when the second pulsation is weaker than the first, the third than the fourth, after which there is a stroke as strong as the first: this is the critical pulse of the old writers; the *pulsus caprisans*, admirably named, but rarely felt; it consists in a small pulse, succeeded after a short interval by a large one, conveying the impression of an unsuccessful effort, followed by the overcoming of an obstacle.

Much light has been already thrown on the variations of the pulse in health and disease, and more may be confidently expected, by the use of the sphygmograph invented by M. Marey, and improved in some minor details by Dr. Sanderson. This ingenious instrument may be described as a skilful combination of springs and levers, by which all the changes that occur in the radial artery in a short period of time can be correctly exaggerated and traced on paper, or on an oblong fragment of smoked glass.

It may be well to show by examples the striking differences that have been ascertained to exist between the pulse in health and in one or two diseased conditions. The curves in Fig. 46 show—1. The firm long pulse of vigorous health. 2. The soft pulse of ordinary health. 3. The hard pulse of chronic Bright's disease. 4. The undulatory pulse of typhus. It will be seen that the number of the pulse is indicated as well as its character. Thus, the pulse in 1 is 50; in 2, 56; in 3, 70; in 4, 160. These outlines are selected from the plates given by Dr. Sanderson in his excellent 'Handbook of the Sphygmograph,' to which the reader is referred for fuller information.

Fig. 46



5. THE RESPIRATION.

802. The number and character of the respiratory movements, and the relation they bear to the circulation, frequently engage attention at the bedside. In order to appreciate rightly their value as signs of disease, it must be borne in mind that the muscles of respiration are under the control both of voluntary and involuntary nerves, and that their subordination to the will renders them liable to all those affections of the voluntary muscles in which volition is suspended, lost, or interfered with, such as chorea, tetanus, and hysteria.

803. As respiration may be in part a voluntary act, it is necessary in experimental inquiries to eliminate the disturbing element of the will. For this purpose, I have devised an instrument which registers the number of respirations during a considerable interval without requiring the attention of the experimenter. (See § 670.)

804. At the bedside, the same object may be secured by placing the hand of the patient on the abdomen, as if with a view of counting the pulse. By relaxing the grasp on the wrist, and allowing the hand to rise and fall with the movements of the abdomen, the respirations may be counted, and the interference of the will, always called into play when attention is attracted to the breathing, be avoided. By this means, too, the pulse and breathing may be counted in succession, and compared. This precaution of holding the wrist should be observed even when, the respirations being audible, we prefer to count them by the ear.

805. *Number of the Respirations.*—This is subject to at least as much variety as that of the pulse. The number of respirations in a minute is usually stated at 18, or about one to every four beats of the pulse. For the adult male the estimates of authors vary from 14 to 26 in a minute.

806. The respiration, like the pulse, varies in frequency with age, sex, posture, and time of day—with exercise, rest, and sleep.

807. *Age and Sex.*—Quetelet obtained the following results from about three hundred observations on males, and a smaller number on females:—

AGE.	*Number of the Respirations.* MALE.	FEMALE.
At birth	23 to 70	27 to 68
5 years	32	..
15—20	16 to 24	19
20—25	14 to 24	17
25—30	15 to 21	..
30—50	11 to 23	19

808. The range of my own respiration, from my twenty-eighth to my thirtieth year, as founded on numerous experiments, with the self-regis-

tering instrument, in different postures and under different circumstances, was 12 to 22.

809. Vierordt obtained, as the result of observations on his own person, in the *sitting* posture, a maximum of 15, a minimum of 9, and an average of 12. Hutchinson, in rough and inexact experiments on 1714 healthy males in the same posture, found a minimum of 6, and a maximum of 41; while the greater number were found to breathe 20 times in the minute, and a very large proportion between 16 and 24 times. The recorded frequency of respiration in the persons of the principal experimenters on that function ranges from 14 to 27.

810. *Posture.*—The results of a large number of observations, made on my own person, by the self-registering instrument, were as follows:—For a pulse of 64 the respirations were, standing, 22; sitting, 19; and lying, 13. Hence the rule of the pulse—that the difference between standing and sitting is greater than that between standing and lying—is inverted in the case of the respiration. The respiration in the sitting posture, for different frequencies of pulse, ranged from 15 to 21.

811. *Period of the Day.*—The rule of the pulse is also inverted in respect to the time of day; for whereas the pulse becomes less frequent as the day advances, the respiration becomes more frequent. For the same number of the pulse, there are about 18 respirations in the evening for 17 in the morning. The same rule obtains in disease in both sexes, even in those cases in which the pulse becomes more frequent in the evening.

812. *Sleep.*—In a woman, ætat. 27, Quetelet found the respirations to be, awake, 27; asleep, 21. In two young children the differences were 5 and 8 respectively. In his experiments the respiration was more affected by sleep than the pulse.

813. The other causes which in health affect the frequency of the pulse, produce a like effect on the respiration. Thus, all causes which increase the frequency of the pulse and the force of the circulation, also augment the number of respirations, and the reverse. Exercise increases the number of respirations, rest diminishes them: heat increases and cold diminishes the frequency both of the pulse and breathing. Sleep, which lowers the pulse, has a still more marked effect on the breathing. The only exception to the rule is that of debility; for debility without disease, provided it be not extreme, is accompanied by an infrequent pulse, while the number of respirations is increased in every degree of debility.

814. *Proportion of the Respiration to the Pulse.*—This has been variously estimated by authors, at 1 to 4, 1 to 4½, and at 1 to 5. But no dependence can be placed on these estimates, as they were formed in ignorance of the effect of posture on the breathing. In experiments on my own person, made with the self-registering instrument, the proportion has varied between 1 to 2·60 and 1 to 5·23; and in the sitting posture from 1 to 2·61 to 1 to 5·00.

The chief causes of the different ratios of pulse and respiration are the posture of the body, the time of the day, and the number of the pulse itself.

815. *Posture.*—For a pulse of 64, the proportion, standing, was 1 to 2·95; sitting, 1 to 3·35; and lying, 1 to 4·97.

816. *Time of Day.*—The proportions morning and evening for the same frequency of pulse are about 1 to 3·60 and 1 to 3·40.

817. *Number of the Pulse.*—The ratio of the respiration to the pulse decreases as the pulse increases; for a pulse of 54, being 1 to 3; for a pulse of 72, 1 to 4. As a general rule, the number of respirations increases with that of the pulse, but in a less rapid ratio, the proportion decreasing as the pulse increases. It is believed that these statements, founded on my own observations, will be found in the main correct.

818. In disease the number of respirations varies within much wider limits than that of the pulse. The smallest number I have counted is 6 in a female in a deep sleep, but not comatose, after attempting suicide by laudanum; and I have counted as few as 10 respirations in a case of paralysis. On the other hand, I have reckoned as many as 44 in a case of phthisis, 73 in a case of paralysis agitans, and 140 in a case of hysteric asthma. Floyer met with 60 respirations in a case of suffocative catarrh, and in a case of inflammation of the lungs in a child: on the other hand, he counted as few as 7 in more than one attack of asthma. Dr. Graves has recorded as small a number as 12, and as many as 50, in cases of fever.

819. *Ratio of the Respiration to the Pulse in Disease.*—Floyer found it as high as 1 to 2 in a case of suffocative catarrh, and as low as 1 to 14 in a case of asthma; Dr. Graves observed as high a proportion as 1 to 2 in one case of fever, and as low a proportion as 1 to 20 in another. In the case of paralysis agitans already referred to, I counted a pulse of 72 and 73 respirations: in the case of hysteric asthma, 144 pulses and 140 respirations; in a case of transposition of the heart, 32 respirations to 46 pulses; and in a case of paralysis, 1 respiration to 6½ pulses. In a case of aneurism of the heart reported by Mr. Peacock there were 34 respirations to 33 pulses.

820. These remarkable variations in the number of the respirations as compared with that of the pulse are readily explained, if we reflect that the respiration is influenced by many other causes besides the quantity of blood sent to the lungs by the heart. Some of these are internal, some external. The principal internal causes are the state of the lungs themselves, and of their investing membrane. Among external causes are mechanical obstructions, such as the pressure of tumours on the air passages, constriction of the chest, increased or diminished action of the muscles of respiration, &c. All these obstructions to the free play of the lungs quicken the breathing; and this, whether accompanied by a feeling of uneasiness or not, has been called dyspnœa. As this is the chief symptom of all diseases of the lungs, and a concomitant of a great

majority of diseases of the heart, its chief causes are here presented in a tabular form.*

CAUSES OF INCREASED FREQUENCY OF RESPIRATION, OR DYSPNŒA.

	I. *Quantity of blood in lungs increased.*		
	a. With quickened circulation.		Exercise, repletion, plethora (1st degree), inflammatory fevers, hypertrophy of the right side of the heart.
	b. With obstacle to return of blood to the heart.		Diseases of the mitral valve, pressure on the pulmonary veins, &c.
	II. *Quality of the blood altered.*		
	a. More venous than usual.		Morbus cœruleus, &c.
	b. Red particles deficient.		Anæmia, chlorosis.
	III. *Deficiency of oxygen.*		
	a. Air pure, but small in quantity.		Air rarefied by high temperature, or diminished atmospheric pressure.
	b. Air defective in quality.		Non-poisonous gases, as nitrogen and hydrogen.
	IV. *Mechanical obstructions.*		
Internal.	*a.* Of the air tubes.		Diminished size from thickening of walls, from pressure, and from accumulations of mucus.
	b. In lungs themselves.		Congestion, hepatization, œdema, tubercle, &c.; emphysema, dilated bronchi, vomicæ, &c.
	c. In pleural sac.		Hydrothorax and pneumothorax, pleuritic affections and adhesions.
	d. Caused by other organs.		Enlargement of the heart or large vessels, aneurismal tumours.
External.	*a.* In parietes of chest.		Malformations and distortions, ossification of cartilages, &c.
	b. In abdomen.		Enlarged viscera, tumours or dropsical effusions.
	V. *State of the muscles of respiration.*		
	a. Paralysis (partial).		Injuries of the spinal marrow, in the neck, &c.
	b. Debility.		From fatigue, from exhaustion, after severe febrile affections, and at the approach of death.
	c. Pain	1. In muscles.	In intercostals, diaphragm, or abdominal muscles, those acting which are free from pain.
		2. In surrounding parts.	In the abdomen in peritonitis, in the chest in pleurisy, the muscles that cause least pain acting alone.
	d. Spasm.		Tetanus, hydrophobia, &c.
	e. Other forms of augmented innervation.		Strong mental emotions: hysteria, asthma.

821. The chief causes of diminished frequency of respiration are sleep and coma, however produced, whether by narcotics or by cerebral pressure. The respiration, therefore, is slow in apoplexy, and in narcotic poisoning.

822. Other characters of the respiration, besides increase of number, merit attention; as the full or deep, the small or feeble, the equal or

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* A similar table is given by Dr. Williams in Lib. Pr. Med. vol. iii. p. 25.

unequal; the regular or irregular; the short, quick, and catching; the long, the labouring; the thoracic, abdominal, and diaphragmatic.

823. A peculiar respiration has been observed to be associated with fatty degeneration of the heart. The patient, after remaining in a state of apnœa for a quarter of a minute or more, has a feeble respiration followed by a succession of breathings, increasing in force up to a maximum of strength, and then as gradually diminishing. This phenomenon has been described by Drs. Cheyne, Stokes, and Sibson.

824. The number of respirations taken by itself is of comparatively little value; it is only when combined with observations on the pulse, or examinations of the chest by percussion and auscultation, that we learn its real significance. Thus, a frequent respiration, taken alone, may arise from any one of the many causes specified in the table; but coupled with an infrequent pulse, in the ascertained absence of visceral disease, would strongly indicate great debility, or, in the absence of this, hysteria. On the other hand, an infrequent pulse and respiration combined would as probably arise from some disease or injury of the brain, or of the upper portion of the spinal cord. Again, a frequent and quick respiration, in the absence of visceral disease, and attended by acute pain of the walls of the chest or abdomen, is explained by the existence of that pain, whether its seat be the muscles or the peritoneum.

825. Important indications may also be obtained by noting the number of respirations day by day in acute diseases. In pneumonia, for instance, a daily diminution in the number, with or without a similar change, in the pulse, gives good hope of recovery; in apoplexy or in narcotic poisoning, on the contrary, an increase in the number, especially if attended by increased frequency of pulse, may be considered a good symptom. So in convalescence from fever, with great debility, a diminished frequency of respiration, with increase in the number of the pulse, is a sign of returning strength.

826. In using these, as well as the less important symptoms and signs of disease, the observer should be on his guard against the common error of trusting too implicitly to any one sign, however valuable, to the neglect of others which are capable of affording useful information. In diseases of the chest, for instance, neither stethoscopic signs, nor respiration, nor pulse alone, can furnish the practitioner with all the information which he wants; but if, knowing the exact value of each of these signs and the fallacies attaching to each, he uses all of them at the same time, there are few difficulties in diagnosis which he will not be able to overcome.

6. OTHER SYMPTOMS AND SIGNS OF DISEASE.

827. Besides the signs and symptoms minutely examined in the first five divisions of this chapter, there are many others of which it is easier to recognise the importance than to arrange them in a manner free from objection. Some of them, as the expression of the counte-

nance, the appearance of the tongue, and the presence or absence of pain, are subjects of observation and inquiry in every case of disorder or disease without exception; while others, as the appearance of the sputa, or of the discharges from the bowels, are noted only, or chiefly, in diseases of the lungs, or of the primæ viæ. Yet these symptoms of larger import often associate themselves very naturally with others of very limited application—*e.g.*, the appearance of the tongue with that of the lips and gums in anæmia; so that it seems reasonable to group them together, and to treat them in connection with each other. Accordingly, the remaining symptoms and signs will be examined in this section under the distinct heads of—1. The organs of digestion. 2. The organs of circulation. 3. The organs of respiration. 4. The urinary and genital organs. 5. The nervous system. 6. The temperature of the body. 7. The expression of the countenance, and the condition and attitude of the body.

828. (1.) THE ORGANS OF DIGESTION.—The condition of the alimentary canal is revealed to us in part by the state of the tongue; in part by alterations in the functions of the stomach and intestines, such as nausea, vomiting, and purging; and in part by the character of the matters voided from the stomach and bowels.

829. The value of the *tongue* as a symptom or sign of disease, and an aid in diagnosis and prognosis, will be understood if it is borne in mind that it consists of a dense mass of muscular fibre, largely supplied with blood, covered with a secreting membrane, and lying in a bath formed of the secretions of the mouth and salivary glands. It may, therefore, be expected to indicate the state of the muscular and nervous system, of the circulation, of the secretions generally, and especially of those of the alimentary canal, to which it belongs by continuity of membranous covering, and as subserving the function of mastication.

830. The tongue does not present the same appearance in all healthy persons. In some it is habitually clean, in others slightly furred; in some florid, in others pale, in some compact and firm, in others flaccid and indented by the teeth; in some it is protruded in a relaxed state, in others strongly contracted and drawn to a point. Even in the most healthy persons it is covered with a thin white fur in the morning before taking food, and those who sleep with the mouth open awake with a perceptible dryness of tongue.

831. In disease, the tongue presents a variety of appearances. As to *size*, it is swollen in inflammation of the organ itself, in severe diseases of the adjacent parts, in salivation from mercury, and in malignant disease; on the other hand, its size is diminished when there is much emaciation. The swollen tongue is often indented by the teeth, an appearance which it also wears in that relaxed and flabby state that often accompanies great debility. Its *form* varies with the mode in which it is protruded; but as a general rule, it is small and pointed in "irritation," broad and flabby in exhaustion. The *temperature* of the

tongue is low in syncope and apnœa, and, in common with the breath, is very low in epidemic cholera. Its *colour* coincides, to a certain extent, with that of the general surface, being florid in plethora; pale after profuse discharges, in anæmia and allied states of system, and in many chronic wasting maladies; and livid in apnœa and in certain diseases of the heart and lungs which greatly impede respiration. Its colour also depends on the state of the digestive organs. Thus it is universally red, or red at the tip, or at the edges, or in both situations, in some cases of acute inflammation of the mucous membrane of the stomach and bowels. It is also very red and tender in some cases of scarlatina, and in continued fevers after the disappearance of the fur. A smooth red tongue, sometimes known as a 'glazed' tongue, is often present in fever accompanied by great irritation of the stomach and bowels, and in idiopathic affections of those organs. In acute inflammation of the throat, the tongue also assumes a deep red colour. In poisoning by the mineral acids it is stained of characteristic colours, and has its epithelial covering partially or wholly removed.

832. Much importance attaches to the state of the tongue in respect of *moisture*. As the tongue of a healthy person is kept moist by the secretions of the mouth, and by the saliva, it becomes dry when those secretions fall short of the quantity required to supply the loss by evaporation and that which from time to time passes down the gullet in the act of swallowing. It is obvious, therefore, that the tongue must afford a valuable index of the state of the secreting organs, and of the condition of the circulation, as promoting or retarding their proper functions. Accordingly a dry tongue, such as exists in inflammatory and febrile states of system, indicates a state of circulation unfavourable to secretion in other organs as well as in the tongue and mouth. On the other hand, a moist tongue indicates a favourable state of the secretions generally, and the absence of any high degree of inflammation or fever; and it is obvious that a transition from a dry to a moist tongue must always be a favourable sign. Hence, in cases of fever, the physician carefully inspects the tongue, examines it by the touch, and hails a moisture appearing at the edges, and gradually extending to the centre, as the sign of a freer state of all the secretions, and a mark of approaching convalescence. Again, a moist and flabby tongue, indented by the teeth, is justly regarded as a sign of want of tone and vigour, and an indication of a state of circulation favourable to secretion from other organs as well as from the mouth.

833. A *fur* collects on the tongue in almost all severe diseases:—a white creamy fur in the first stage of fever, in catarrh, in quinsey, in most severe inflammations, and in acute rheumatism; a thick brown or black coating in more advanced stages of fever; or the tongue is dry, parched, and tender. A thick, black, dry fur, with black *sordes* about the teeth, is seen in the typhous stage of fever, and in low typhous conditions of the system, coinciding with a highly impure state of the blood, with unhealthy secretions, and fetid discharges from the bowels. A brown dry fur exists in cases of local irritation, the tongue becoming

moist as the irritation subsides. In jaundice, the fur is sometimes tinged with bile, and in scurvy it is blackened by effused blood. In dyspepsia, the appearance of the tongue is very variable. Sometimes a thick fur collects at the base, while the tip and edges are bright red; sometimes the fur extends over the whole surface, and is accompanied by indentations of the teeth, by partial abrasions of the epithelium, and by deep cracks, which are often strongly marked in spirit drinkers. Deep foul ulcers of the tongue, with hard borders, are common consequences of syphilis. In constipation the tongue is sometimes covered with a brown fur; but it may present no unusual appearance.

834. There is a very peculiar and characteristic appearance of the tongue in scarlatina. The papillæ, elongated and florid, protrude through a white coating of fur; or, the tongue being bright red and free from fur, the papillæ appear distinct on the red ground. In the first case the tongue closely resembles a white, in the second a red, strawberry.

835. In common with the lining of the mouth and throat, the tongue may be the seat of small superficial ulcers, known as *aphthæ*. These are common in infancy, when they constitute the "thrush;" also in the last stage of pulmonary consumption, and towards the fatal termination of other chronic visceral diseases.

836. The mode in which the tongue is *protruded* is often characteristic. Sometimes it is tremulous in extreme weakness, in cases of idiopathic fever with debility, and under the influence of fear. It is protruded with difficulty when dry; slowly and hesitatingly in diseases accompanied by stupor, in which case it is withdrawn after an interval, and as if in consequence of deliberation. In partial paralysis the tongue is protruded either towards the sound or the affected side of the face.

837. The *gums* afford signs rather of the state of the circulation than of the digestive organs. They are florid in plethora; pale in anæmia: livid when respiration is much impeded; swollen and dark, and apt to bleed on the slightest touch, in sea and land scurvy; swollen with an inflamed line in mercurial salivation; marked with a blue line in poisoning by lead.

838. The *lips* and membrane of the mouth, like the gums, indicate the state of the circulation. They are pale in anæmia; dry and parched when the tongue is similarly affected, the seat of aphthous ulcers in young children, in consumption, and towards the close of febrile and inflammatory affections. An herpetic rash on the lips is a common and characteristic accompaniment of severe catarrh.

839. The *teeth* afford some useful indications. During the first dentition they are the source of much suffering, of severe febrile symptoms, of marked disturbance of the functions of the alimentary canal, of convulsions, and of eruptive diseases. In later life, sound teeth are an indication of vigour, and their early decay is one of the marks of a feeble

or scrofulous constitution. Caries of the teeth may, however, be induced by habitual indigestion, by the excessive use of sweets and acids, and by the abuse of mercury. Workmen who handle mercury are also subject to chipping of the teeth. The teeth grow loose in scurvy, and during salivation with mercury. They are covered with dark brown or black sordes in continued fevers and in typhous states of system. *Grinding* of the teeth in sleep is common in children suffering from worms or other intestinal irritation, and *chattering* of the teeth accompanies the severe shivering fits that usher in many febrile disorders, and form part of the paroxysm of ague.

840. The *fauces and tonsils* are subject to chronic inflammation and swelling, and the *uvula* to relaxation, which may be taken to indicate want of constitutional vigour. The same parts are the seat of inflammation in scarlet fever, diphtheria, and severe attacks of catarrh; and of ulceration in secondary syphilis. The tonsils are liable to intense inflammation and great enlargement in quinsey, and they are the seat of a painful chronic irritation in persons who use the organs of speech unskilfully.

841. *The Saliva.*—An increased flow of saliva sometimes occurs as the result of irritation of the salivary glands, in inflammation of the mouth and parts adjacent, sometimes as the consequence of dentition in children, and of unsound teeth in the adult; sometimes, again, as an effect of certain active medicines, such as mercury, iodine, antimony, and their preparations, of prussic acid and digitalis. An increased flow of saliva is not uncommon in pregnancy. Mercurial salivation is attended by soreness of the gums, a brassy taste, and a peculiar fœtor, which serve to distinguish it from mere increase of saliva; also by a febrile disturbance known as the *mercurial erethysm.* Frothing at the mouth, due in part to increase of saliva, and in part to increased mucous discharge from the air-passages, is a common symptom of epilepsy and hydrophobia, in the first of which diseases the froth is, as it were, churned out of the mouth by convulsive movements of the muscles of the tongue, mouth, and lips; while in the second it is spit out between the closed teeth.

842. *The Taste.*—The sense of taste is impaired in all diseases in which the tongue becomes dry or furred; and probably in apoplectic seizures. A bitter taste is often present in jaundice, and on waking in the morning in persons suffering from feverish attacks, or from severe dyspepsia; and it may be caused instantaneously by strong mental emotion. Consumptive patients often complain of the salt taste of their sputa, and a putrid taste is present in diseases in and about the mouth attended by decomposition. Some dyspeptics also complain of a taste as of rotten eggs; and a brassy taste is one of the signs of mercurial salivation. It is probable that the sense of taste is subject to illusion in madmen who swallow their vomited matters, urine, and fæces.

843. *The Appetite.*—Loss of appetite (anorexia) and distaste for food (nausea) are among the earliest symptoms of indisposition, and the most

constant attendants of severe illness: on the other hand, a restored appetite is among the earliest indications of convalescence. A failing appetite, again, is an unfavourable symptom in chronic maladies, and in advanced age; but it may be caused in persons not suffering from disease by want of exercise and fresh air, and by depressing passions. A voracious appetite (bulimia) is an occasional result of irritation of the stomach, or of intestinal worms; and it is sometimes a disease of itself, not easily traced to its true cause. It is often present in the mesenteric disease of children, in whom that part of the food which should have nourished the body is prevented from entering the lacteals. A voracious appetite is also common during established convalescence, obviously as a means of repairing the wasted body. Intense hunger is one of the after-effects of Indian Hemp. In some cases it is associated with frequent vomiting of food, as in inflammation attacking the stomach near the pylorus. A depraved appetite (pseudorexia) occurs in pregnant females, in chlorosis, and in hysteria, and in some forms of insanity.

844. *Thirst* is a common symptom of disease. It is present in active inflammations, and in violent febrile attacks, in consequence, probably, of the tongue, mouth, and throat partaking of the vascular fulness of the whole system, and suffering from an inconvenient and distressing dryness. It also occurs in accidents and diseases attended by sudden loss of blood, or rapid outpouring of some important secretion, as in diarrhœa, dysentery, and cholera; in diabetes; in some forms of dropsy; and in cases of phthisis attended with profuse perspiration. In healthy persons it always follows strong exercise, and it is the most urgent suffering of the soldier on the march, and of the wounded on the field of battle. It is also a consequence of the excessive use of saline matters, as in the sailor fed on salt meat, and, in a less degree, of condiments to excess; and it is a leading symptom of irritant poisoning. An excessive desire for liquids is known as *polydipsia.*

845. *The Odour of the Breath.*—Liquids having a strong and peculiar odour, or imbibing it from food with which they are mixed, pass readily from the stomach into the circulation, and being eliminated by the lungs, taint the breath. The odour of spirits, due to this cause, sometimes enables the medical man to distinguish the effects of intemperance from an apoplectic seizure. A foul breath is among the symptoms of dyspepsia, of that unhealthy condition of body known as *cachexia*, of salivation, of advanced stages of fever, of scurvy, and generally of inflammations in and about the mouth, attended by decomposition; or followed by gangrene. It is accordingly present in gangrene of the mouth, and in caries of the teeth. On the other hand, an extremely offensive breath is sometimes traceable to gangrene of the lungs. The breath has been observed to have the odour of honey in saccharine diabetes.

846. *Vomiting* as a symptom of disease can only be duly appreciated by bearing in mind that the stomach is not merely the chief organ of digestion, but a viscus in close nervous relation with the brain, heart, and lungs. Vomiting therefore may be a symptom of disorder or disease

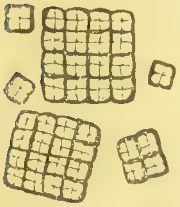
in the stomach, as well as a consequence of severe injury or disease of the more important organs of the body, or of shocks to the nervous system. Among the causes affecting the primæ viæ may be mentioned, simple overloading of the stomach; irritating food; inflammation of its mucous membrane, by whatever cause produced; obstruction to the passage of the food through the pylorus, as in cancer of the stomach; permanent obstruction to the passage of the fæces through the intestines, as in ileus and strangulated hernia; and inflammation of the entire alimentary canal, as in English and Asiatic cholera. Vomiting is also a common effect of irritant, and narcotico-acrid poisons, and sometimes attends poisoning by the pure narcotics, especially carbonic acid. It is also a common effect of chloroform. To the more indirect and remote causes of vomiting belong concussion of the brain, the condition of the brain preceding an apoplectic seizure, and inflammation of its substance and membranes. Vomiting, again, accompanies the passage of gallstones, and of renal calculi, and severe inflammation of the heart, and of the womb. It is also very common in delicate females, and is one of the most constant symptoms of pregnancy. Lastly, vomiting is often amongst the earliest premonitory symptoms of severe attacks of the febrile exanthemata, and particularly small-pox.

In vomiting dependent on diseases of the stomach and bowels, it is important to note the time after a meal at which it occurs. As a general rule, if it follows immediately, or quickly, on the reception of food, it is attributable to inflammation of the mucous membrane of the stomach itself. In ulcers of the stomach it is retained longer. If the food is rejected after an hour or more, the cause may be traced, with great probability, to the pylorus or duodenum. If the vomited matters do not consist of food, this inference will not hold good. When, instead of a single act of vomiting ushering in an attack of illness, the vomiting recurs again and again, it must be looked upon as an unfavourable complication, except in pregnant women.

847. *Vomited Matters.*—We are often assisted in our diagnosis by examining the matters rejected from the stomach. The food is returned nearly unchanged in irritation, inflammation, ulceration, or obstructive disease of the stomach itself, in pregnant women, in vomiting due to remote constitutional causes and nervous shocks, and under the operation of many irritant poisons. Clear acid liquids are vomited after an interval of from half an hour to two hours or more in the disease known as gastralgia or gastrodynia. Bile regurgitates from the duodenum, and is discharged by vomiting, in functional and organic diseases of the liver. Blood is often discharged in very large quantities in the disease known as hæmatemesis; generally of a dark colour, clotted, and mixed with food; rarely of the florid hue of hæmoptysis. The blood so discharged may flow from the general surface of the stomach, or from one or more ulcers in the mucous membrane; or it may regurgitate through the pylorus from the duodenum. A discharge of a large quantity of florid blood may be the result of an aneurism bursting into the stomach. A brown grumous matter, often mixed with blood, is rejected from the

stomach in poisoning by the corrosives. Vomiting of purulent or muco-purulent matter points to the rupture of an abscess of some neighbouring viscus. Feculent vomiting is a symptom of mechanical obstruction of the lower portion of the intestinal canal, or of a fistulous communication between the stomach or upper part of the small intestines and the colon. In a highly acid state of the contents of the stomach, a scanty mucus, or a clear acid liquid, abounding in small round black flakes, is sometimes vomited. These matters, when placed under the microscope, are found to contain the vegetable growths described by Goodsir as *Sarcina ventriculi* .(Fig. 47.)

Fig. 47.



848. The *bowels* are variously disordered; sometimes confined from torpor, from the absence of their natural stimulus, from mechanical obstruction, or from the operation of the poison of lead; sometimes relaxed, from inflammation of the mucous membrane, whether caused by previous constipation, unwholesome food, purgative medicines, or irritant poisons. Diarrhœa is also a constant consequence of ulceration of the intestines in typhoid fever; it is common in pulmonary consumption, uniformly present in advanced stages of tabes mesenterica, and very prevalent during the heats of summer. It is an occasional consequence of a change of residence from cold to hot climates, and from low situations to elevated ones. Strong mental emotions also sometimes give rise to diarrhœa. In union with vomiting it constitutes English and Asiatic cholera, and a leading symptom of irritant poisoning. Frequent and scanty discharges of mucus, pus, or blood, with great tenesmus, mark the disease known as dysentery.

849. The alvine discharges may consist of mucus, tenacious lymph, or pus, as in inflammations of the mucous membrane of the canal, the nature of the secretion depending on the degree of inflammation; or they may consist of blood poured out by the vessels of the intestines generally, by those of the large intestines exclusively, or by the enlarged veins of the rectum (piles). In tabes mesenterica they consist chiefly of ill-digested food, and in disease of the pancreas they contain an unusual quantity of fat.

850. The evacuations may be pale from the absence of bile; unusually yellow from its excess; green, as often happens in children; dark and offensive, from the long retention of feculent matter, or from morbid secretions of the liver; dry from long retention, and in detached masses known as *scybala*. They assume a light yellow colour under the use of mercurial preparations; a green colour from the mineral acids in large doses; preparations of iron turn them black, as does also the admixture of blood in large quantity.

It is important to distinguish those discharges which flow from the general surface of the intestines from such as are the product of disease in the rectum. When, therefore, pus or blood is discharged with the motions, and the symptom is not promptly relieved by proper aperient medicines, the rectum should be examined for piles or fistula, or (if florid blood is poured out in considerable quantity) for a bleeding artery laid bare by ulceration.

851. We are often assisted in our diagnosis by comparing the discharges from the stomach with those from the bowels. Thus, obstinate constipation, with vomiting of feculent matter, implies mechanical obstruction, as in strangulated hernia; while vomiting of feculent matter, mixed with imperfectly digested food (*lientery*), goes far to justify the inference that a fistulous opening exists between the stomach or beginning of the small intestines and the colon (ileo-colic fistula).

852. THE ORGANS OF CIRCULATION.—The most important symptom and sign of disease connected with the circulation is the pulse, which has been minutely examined in a former division (4) of this chapter; and some indications of the state of the *capillary circulation* have also been considered when speaking of the gums, lips, and lining membrane of the mouth. Similar indications of the state of the circulation through the small-vessels, and of the full or empty state of the vessels generally, are afforded by the appearance of the skin, which is pale after losses of blood, in anæmia, in leucocythemia, and in analogous states of system, universally florid in plethora, of a brighter or duskier red, in patches of greater or less extent, in the febrile exanthemata, livid in diseases of the heart and lungs attended with imperfect aëration of the blood, and yellow in jaundice, from the retention in the blood of bile which ought to be eliminated by the liver. The languid circulation of old age is marked by dark discoloration of the skin of the legs; and habits of intemperance often betray themselves by the appearance of the skin of the face, permanently mottled with streaks and spots of dark-red on a yellow ground. In extreme debility, such as occurs in sea and land scurvy, and in the typhous stage of continued and remittent fevers, the small vessels often give way, and the blood is shed into the surrounding tissues. When the effusion is large, it is called an *extravasation;* when it forms small round spots in the skin, these are called *petechiæ*. Extravasations and petechiæ do not disappear on pressure; but the redness due to plethora, inflammation, or congestion, readily disappears on pressure, but quickly returns on its removal.

853. *The veins*, by their distended and swollen state, sometimes supply useful aids to diagnosis. When, for example, the sounds heard over the region of the heart lead us to infer valvular disease, but leave us in doubt as to the particular valve affected, a visible pulsation in the jugular veins accompanying each beat of the heart indicates regurgitation of the blood through the imperfectly closed *tricuspid* valve. When the pulsations are very distinct, we infer that the walls of the right ventricle are thickened. In very rare cases, a visible pulsation is communicated to the veins by the transmission of the heart's impulse through the capillaries. This is called the *venous pulse*, and indicates an unusually strong action of the heart. This true venous pulse requires to be distinguished from the lifting of a vein by the force of the artery lying beneath it. The superficial veins sometimes become greatly distended

and highly varicose from the closure, by pressure or disease, of some deeper-seated venous trunk.

854. (3.) THE ORGANS OF RESPIRATION.—Though the number of the respirations, and the proportion which they bear to the pulse, as well as the respiratory movements generally, have been minutely examined in a former part (5) of this chapter, several symptoms and signs of disease, due to disturbance in the functions of the lungs, remain to be considered. Certain respiratory movements, for instance, such as sighing, yawning, sneezing, and coughing, to which may be added the noisy inspiration known as stertor, deserve notice, as well as the changes which the pulmonary secretions undergo in disease, and the odour and temperature of the breath. The signs derived from the altered character of the respiratory movements may be treated under the two heads of *noisy inspiration* and *noisy expiration.*

855. *Noisy Inspiration.*—In healthy persons the air is drawn into the chest, and expelled from it noiselessly; but there are diseases which are accompanied and characterised by peculiar inspiratory sounds. The long loud whooping inspiration following the complete emptying of the lungs by a succession of violent expirations, or coughs, is the familiar pathognomonic sign of whooping cough; laryngismus stridulus is recognised by the peculiar *crowing* character of the inspirations; and croup by a similar inspiratory sound compared to the crowing of a cock. Attacks of spasmodic and humoral asthma, again, are marked by the loud wheezing or whistling which accompanies each drawing in of the breath. *Stertor*, *stertorous breathing*, or snoring, is another form of noisy inspiration which owes its origin to the flapping of the soft palate when inactive, as in sound sleep, or paralysed, as in cerebral congestion. Accordingly it is present in apoplexy, and in compression and concussion of the brain; and is one of the group of symptoms known as *coma*. *Sighing* and *yawning* may be classed under this head. They are forms of deep and audible inspiration, which, as a general rule, indicate the previous imperfect performance of the function of respiration, through deficient nervous power; from congestion of the lungs; or from a slight mechanical impediment to the complete expansion of the chest. As a general rule, sighing is expressive of emotion or intense occupation of the mind, and yawning of bodily fatigue. Yawning is also present in many nervous affections falling short of well-defined disease, and it attends the accumulation of urea in the blood. In the congestion of the lungs which follows recovery from asphyxia, after fainting fits, and during hysterical attacks, sighing and yawning are common occurrences. Among mechanical impediments inducing yawning or sighing as supplementary to the ordinary movements of respiration, may be specified the restraint of stays in women, and in either sex the accumulation of flatus in the stomach hindering the downward movements of the diaphragm. Either of these mechanical impediments may bring on hysterical paroxysms in persons predisposed to them. Another form of noisy inspiration is *hiccough.* This is a short inspiratory movement, which affects chiefly the diaphragm. It is nearly allied in character to that common expression

of grief, *sobbing.* Hiccough is often experienced to a painful degree in the act of eating, when the food is swallowed hastily. It is also a symptom of inflammation of the diaphragm, or of those viscera, or parts of viscera (such as the liver, pancreas, duodenum, or cardiac extremity of the stomach), which are in contact with it, or lie adjacent to it; and it is common in diseases of the kidney. Tumours pressing on the pneumo-gastric nerve are sometimes the cause of obstinate hiccough. It accompanies the feculent vomiting of strangulated hernia, and often occurs towards the termination of many acute maladies, when it must be looked upon in a very unfavourable light.

856. *Noisy Expiration.*—Sneezing and coughing are the two forms of noisy expiration, requiring notice as symptoms and signs of disease. *Sneezing* is a violent expulsion of air through the nostrils, following a deep and full inspiration. It either serves to clear the nostrils of some cause of irritation, or it marks the swollen and painful state of the lining membrane which ushers in attacks of catarrh and of measles. It is a symptom of longer continuance in the disease known as hay-asthma. It is also one of the group which marks the poisonous action of iodide of potassium. In common with other violent movements of the muscles of respiration, it may occur in hysteria. *Coughing* is a violent expiratory effort by which the air-passages are freed from offending matters, as the nostrils by sneezing. The contents of the air-tubes thus expelled are said to be *expectorated*, and the act of expulsion is called *expectoration.* The matters themselves are known as *sputa.*

There are many different kinds of *cough.* A cough may be *dry*, or unattended by expectoration; or *moist*, that is to say, accompanied by *sputa.* The dry cough may be due to irritation of the pulmonary branches of the pneumo-gastric nerve, or to the pressure of tumours and morbid growths on some part of the air-passages. Hence a dry persistent ringing cough will sometimes indicate aneurism of the aorta. A dry cough is also present in the early stage of inflammations of the air-tubes, when the blood vessels are in a state of fulness unfavourable to secretion. This happens at the onset of attacks of catarrh, influenza, and croup, and in the first stage of humoral asthma. A dry cough is also one of the results of dyspepsia, of obstinate constipation, and of intestinal worms; and a loud, dry, barking cough is recognised as a symptom of hysteria. The cough in incipient phthisis is either dry or attended with scanty expectoration on rising in the morning or at distant intervals. An inflamed state of the fauces, with enlarged tonsils and relaxed uvula, is another cause of a dry cough. Inflammation or ulceration of the larynx and trachea also gives rise to a troublesome dry cough, or one attended with very scanty expectoration. When the seat of the disease is the upper part of the larynx, the dry cough is accompanied by a hoarse voice. A short, dry cough, attended with acute pains in the side, is one of the symptoms of pleurisy. A dry cough coming on in paroxysms is called a *spasmodic* cough, and may be often traced to inflammation of the liver, to biliary obstruction, or to disease of some viscus situate near the diaphragm. But coughs accompanied by free expectoration, when occurring in paroxysms, are also termed spasmodic. A *moist cough*, or a cough accompanied by expectoration, is more common than the dry cough. Such a cough is present in catarrh, in bronchitis, in confirmed phthisis pulmonalis, in whooping-cough, in pneumonia, in gangrene of the lungs, and in hæmoptysis.

857. *The Expectoration*, or *Sputa.*—The matters coughed up from the lungs often furnish important information; but to interpret them aright, we must bear in mind the fact, that substances spit out, or otherwise rejected from the mouth, may consist of the secretions of the mouth and throat, of the nostrils, or of the lungs, as well as of the secretions and contents of the stomach; and it is not always easy to ascertain, from the descriptions of a patient, which of these parts has supplied the matters submitted to inspection. When, for instance, the fluid consists wholly or chiefly of blood in large quantity, it is not always easy to ascertain whether it came from the lungs by an almost imperceptible cough, or from the stomach by an easy act of vomiting; when, on the contrary, the quantity of blood in the sputa is small, it may be equally difficult to determine whether it was hawked from the throat or coughed from the lungs. Young children generally swallow expectorated matters.

858. Having ascertained that the matters submitted to examination come from the lungs, we should consider their quantity, both absolutely, and relatively to the time occupied in their discharge, as well as their quality. As a general rule, a continuous and abundant expectoration, especially if coughed up with ease, may be regarded as favourable, as far, at least, as the present state of the patient is concerned. Such an expectoration exists in the moist stage of common colds, in chronic bronchitis, in confirmed phthisis, and in whooping-cough.

859. On the other hand, a scanty expectoration ushers in all acute attacks of disease of the lungs, though it also exists in the first stage of a common cold, and throughout the incipient stage of pulmonary consumption. It marks the first onset of a fit of humoral asthma, and the first stage of pneumonia. Again, a transition from a scanty to a more abundant secretion may be looked upon as a favourable symptom, just as the reverse indicates a relapse or increase of disease. When a scanty secretion, coughed up with difficulty, is streaked with blood, it may be taken as evidence of great congestion, or active inflammation of the lungs. Again, a copious sputum brought up in one act or fit of coughing has a significance of its own. It shows either a previous accumulation of the discharged matter in some cavity of the lungs, or in some neighbouring viscus, or a very rapid outpouring of the same from a considerable extent of mucous membrane of the lung itself.

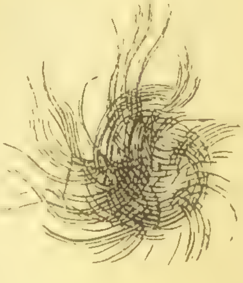
860. The character of the sputa often supplies an important aid to diagnosis; the changes which occur in the course of the same illness being specially deserving of attention. The sputa may consist of unmixed mucus of various degrees of consistence (as in catarrh, bronchitis,

and pneumonia); of a thin watery mucus (in some cases of early phthisis); of a tenacious, gelatinous mucus, mottled with small round brown or black spots, and full of air-bubbles (in the stage of humoral asthma immediately following the dry stage); of a stringy tenacious brown or rust-coloured mucus (in the first stage of pneumonia); of mucus tinged or streaked with dark blood (in the acme of a fit of humoral asthma, in acute pneumonia, and in some cases of phthisis pulmonalis); of mucus blended with pus (in fully developed catarrh, in bronchitis, and in confirmed phthisis). Again, the expectorated matters may be wholly or chiefly *purulent*, the contents of a cavity suddenly or gradually discharged, or of the sac of the pleura, through a fistulous opening into the lungs; or of an abscess in the liver, in this latter case deeply tinged with bile. The sputa have sometimes an extremely offensive odour, arising from the decomposition of the retained secretions, or from gangrenous destruction of the substance of the lung. Expectoration of *blood*, in larger or smaller quantity, is a common occurrence in disease of the heart and lungs.

861. *Spitting of Blood.*—There are few cases of pulmonary consumption in which this symptom does not happen; and it always furnishes a strong presumption in favour of the existence of that disease. A scanty expectoration of blood may, however, occur in pneumonia, in acute bronchitis, and in the fit of asthma; and a copious and rapid discharge of blood by coughing in the rare disease known as bronchial polypus, and in aneurismal tumours communicating with the air-passages, as well as in confirmed consumption. The colour of the blood, the matters with which, if not pure, it is mixed, and the mode of its discharge, should always be carefully inquired into, as it may be of great importance to distinguish copious hæmorrhage from the lungs, in hæmoptysis, from equally copious discharges of blood in hæmatemesis.

862. The sputa are sometimes submitted to *microscopical examination.* When they are of such consistence as to allow of it, they should be washed lightly in water, as extraneous matters from the mouth are apt to cling to them. Small portions of the mass may then be covered by thin glass and examined. In this way we may recognise the fibres of the elastic tissue of the air-cells (Fig. 48), indicating a destruction of the substance of the lung, as in phthisis and gangrene; casts of the minute air-tubes, as in pneumonia and bronchial polypus; and the small granular matter of tubercle in phthisis. The sputa in this disease are frequently found to be made up of semi-transparent round, oval, or triangular spots, consisting of small granular cells (*tubercle corpuscles*), mixed with free granules and oil-globules. Sometimes, also, they contain fragments of mixed phosphate and carbonate of lime, which effervesce on the addition of an acid.

Fig. 48.



863. (4.) THE URINARY AND GENITAL ORGANS.—The urine itself has been minutely examined in a previous section of this chapter. The indications afforded by the mode of passing the urine remain to be considered. It may be voided with difficulty (dysuria), and the difficulty may be attended by acute suffering at the neck of the bladder (strangury). The slighter degrees of dysuria are sometimes caused by pressure, or by irritation, propagated from a neighbouring organ, the rectum, when loaded with fæces, or worms—causes of dysuria readily removed by a brisk aperient. Enlargement of the womb, as in advanced pregnancy, or irritation of the vagina, as in acute gonorrhœa, may cause the same symptoms in the female. Inflammatory affections of the rectum, such as dysentery, will also occasion it; and the irritant poisons cause it, partly by the inflammation set up in the rectum, partly by the irritating quality imparted to the urine. Two poisons especially, cantharides and turpentine, possess the property of inflaming the whole urinary system, and exciting strangury, with painful erections of the penis in the male, and excitement of the genital organs in the female. Frequent and painful micturition may also be occasioned by a highly acid state of the urine, by gravel, and by the poison of scarlatina when in course of elimination by the kidneys. Affections of the bladder itself, such as inflammation (the offspring sometimes of catarrh, sometimes of gonorrhœa extending from the urethra), ulceration, spasm, and fungous growths, may give rise to the same symptom; or it may be traced to similar affections of the urethra, to stricture, to enlargement of the prostate, or to the passage of calculi.

864. *Retention of urine*, from an obstacle to the discharge of the urine actually secreted, must be distinguished from *suppression of urine* (ischuria), the effect of disease of the kidney arresting the secretion. Retention of urine may result from continued over-distention of the bladder, exhausting the power of the muscular coat; or from disease of the spinal cord paralysing it; or from loss of sensibility through cerebral disease, or extreme functional disorder of the nervous centres, as in continued fever and in typhous states of the system. Spasm of the neck of the bladder is another cause of retention. It bears its part in that caused by want of opportunity to void the urine; and it sometimes occurs in hysterical females. In many cases the cause of retention is mechanical. The seat of the obstruction may be in the ureter (as in the passage of a calculus from the kidney), or in the canal of the urethra from the same cause, from enlargement of the middle lobe of the prostate, or from the pressure of a tumour external to the canal.

865. *Suppression of urine* (Ischuria renalis) means a cessation of the secretion of the kidneys. This may occur in consequence of idiopathic inflammation of the kidney, or of inflammation produced by irritant poisons, especially cantharides and corrosive sublimate. It may also occur after scarlet fever; and it is a symptom of Asiatic cholera. Congestion of the kidney, without inflammation, may also occasion it. The effect of prolonged suppression is great drowsiness, passing gradually into coma.

866. The *sexual organs of the male* occasionally furnish useful indications. A troublesome irritation of the glans penis and prepuce, with frequent erections (priapism), characterises stone in the bladder. Erections, without irritation of the extremity of the organ, also occur from congestion of the kidney, from irritation at the neck of the bladder, and from inflammation of the canal of the urethra. Painful erections, with curvature of the organ, constitute the most troublesome symptom of gonorrhœa. Priapism is also a leading symptom of poisoning by cantharides and turpentine, and of other active poisons of the irritant class. Erection of the penis, with discharge of urine or other fluid, and expulsion of fæces, is also a not uncommon occurrence in death by hanging and decapitation; in poisoning by prussic acid; in the epileptic fit; and in other forms of violent and sudden death.

867. The *sexual organs of the female* are subject to many diseases, some of which deserve notice as symptoms or concomitants of other diseases or disorders of the system. Anæmia, for instance, is often accompanied by amenorrhœa, as is the opposite state of plethora, though less frequently. Certain mental disorders, again, especially some forms of instinctive mania, and some varieties of monomania, are found associated with amenorrhœa, dysmenorrhœa, or the change of life. The importance attached to the menstrual function by patients, and the occasional association of disorders of menstruation with constitutional disturbance, and especially with hysteria, render it expedient for the medical man to inquire into the state of this function in all cases that come under his care. The suppression of the menstrual discharge, the enlargement of the breasts, with the darkened and otherwise altered appearance of the areola, the change in the shape and size of the abdomen, and certain changes in the uterus itself, have great importance as signs of pregnancy.

868. (5.) THE NERVOUS SYSTEM.—The symptoms and signs of disease which have to be treated under this head consist of *a*, altered sensation; *b*, altered muscular action; and *c*, altered mental phenomena.

869. (*a*.) *Altered Sensation.*—All the organs of sense may suffer in three ways: the sensation of which they are the seat may be blunted or lost, heightened or perverted. The muscles also, and those viscera which are not organs of sense, and in health perform their functions unconsciously, may become, through disease, highly sensitive, and the seats of acute pain. Again, all parts of the body, whether endowed with sensibility or not, may manifest pain on pressure, or forcible extension.

870. *Pain.*—In estimating the value of pain as a symptom of disease, we have to consider its degree, its character, its seat, its extent, its duration, its persistence or otherwise, and its concomitants. In estimating the *degree* of pain, it is necessary to bear in mind the difference of expression used by patients in describing it, according as they have more or less general sensibility, more or less fortitude, and more or less honesty. The lesser degrees of pain are usually spoken of as slight, moderate, bearable; the greater degrees as acute, intense, severe, violent, excruciating,

agonising, distracting, intolerable. The only general principle of practical importance which can be laid down in respect of degrees of pain is, that the most acute pain is often occasioned by causes that entail the least danger to life; while the lesser degrees of pain are often present in diseases of far more formidable character. It should also be borne in mind that there are states of system, such as hysteria, which exaggerate pain, and others, such as lethargy and the typhous state, which tend to conceal it.

871. The *character*, like the degree, of pain is subject to considerable variety, and assists us in tracing it to its source and assigning its true cause. A *dull*, *obtuse*, *aching* pain is common in congestions and subacute inflammations, and even in acute inflammations of soft and yielding parts. There is a dull, aching pain in the right side in congestion of the liver, in the loins in congestion of the kidney, and in the head, back, and limbs, at the onset of severe febrile attacks. A higher degree of the dull, aching pain is present in periostitis, rheumatism, gout, and the milder forms of neuralgia, when it is distinguished as a *gnawing* pain. A *burning* pain is often present in severe inflammations, as a combined result of heat and tension. A *throbbing* pain is present in inflamed parts subject to pressure, as in the common whitloe, and also in all abscesses similarly circumstanced. Pain in parts of the intestinal canal is commonly described as *griping* or *twisting*. In scirrhous tumours, and in neuralgia, the pain is designated as *shooting*, *cutting*, *darting*, *lancinating*.

872. The *seat* of pain may afford useful indications by corresponding with the diseased part or organ which occasions it, or by the part affected with pain being in connection with the immediate seat of the disease by the intervention of nerves more or less directly traceable from the one to the other. Thus, disease of the hip-joint occasions pain in the knee; stone in the bladder, pain in the glans penis (in the female, pain at the meatus urinarius); inflammation of the kidney, and calculus in the ureter, cause pain in the groin, thigh, and testicle; disease of the womb, pain in the loins; constipation, pain down the back of the thigh; inflammation of the liver, pain in the right shoulder; and disease of the heart, pain in the left arm, or down to the bend of both arms. Leucorrhœal discharges, and all causes of debility in nervous and irritable females, give rise to pain in the left side; a tender state of the spinal cord, to superficial thoracic and abdominal pains; and irritation at the root of a sensitive nerve to pain in all the parts to which its branches are distributed. Some of these pains are called *sympathetic*.

873. Of the *extent* of pain it may be said (as a general rule) that pain limited to one spot is more likely to indicate severe disease than pain of greater extent. The pains of muscular rheumatism are generally extensive, as are those which attack hysteric females. But, on the other hand, neuralgic pains are often limited to small spots, as the brow, or to single organs, as the testicle or mamma.

874. The *duration* of pain is a point of importance, especially when

taken in connection with the general health. Pain of long continuance, not materially affecting the health, would probably be neuralgic; and in the female would be likely to be connected with other symptoms of hysteria. The *persistence*, or otherwise, of pain is also well worth attention. As a general rule, the pain in important local diseases is *continuous*, though liable to exacerbations, and, under the use of medicines, to abatement. In less important cases pains are *fugitive*, *wandering*, *shifting*. In one disease—brow-ague—the pain is *intermittent*, or *remittent*.

875. The *concomitants* of pain are also highly important. As a general rule, the pain of inflammation is increased by pressure, and muscular pain by motion of the part, or by brisk percussion with the points of the fingers, while neuralgic pains are independent of these causes, and the pains of colic are relieved by pressure. As a general rule, neuralgic, rheumatic, and gouty pains are compatible with health, or with only slight departures from it, while most other pains are associated with marked deviations from it.

876. *Diminished Sensation.*—All the organs of sense may be the seat of sensibility blunted or lost; and as this condition sometimes furnishes important indications, it will have to be considered as it affects the senses of touch, sight, hearing, smell, and taste.

877. The *sense of touch* may be so impaired as to give rise to the sensation of numbness, which may be brought about by cold, by pressure on the trunks of the nerves, or by the local action of narcotic poisons. Long-continued numbness would probably arise from pressure on the trunk of a nerve, or of some disease of the nerve itself, impairing but not destroying its function. Total loss of sensation in any part of the body would follow stronger pressure, or severe disease of the nerve or nervous centres. Loss of sensation in the upper or lower extremities, or in the whole body, is an occasional accompaniment of muscular paralysis of the same parts. A loss of sensibility is occasionally present in hysteric females, and may be brought about by narcotics and by mesmeric manipulations. In examining patients with a view to determine the presence or absence of sensibility, it should be borne in mind that strong muscular contractions may follow irritation of the skin from reflex action, in the absence of sensation.

878. The *sense of sight* is variously affected, not merely from local causes attacking the organ itself, but also from disordered and diseased conditions of brain. Slight and transient affections of the sight are common in dyspepsia, and in slight febrile and other disturbances of the circulation. These affections consist in dark spots (muscæ volitantes), bright spots, sparks, or brilliant colours (as seen by persons drowning or hanging), or in simple indistinctness of vision, in a flickering motion, in a double vision, as in the drunkard, or in a half vision of objects. Spectral illusions have already been considered at p. 109. A heightened sensibility of the retina, accompanied by a dread of light (photophobia),

is a common symptom of acute inflammations of the eye itself, and of inflammatory affections of the brain. It may also be present in acute anæmia from loss of blood, and in the hysteria of weak and delicate females. The opposite state of permanently diminished sensibility of the retina is usually connected with disease of the optic nerve, or of that part of the base of the brain from which the nerve arises. Transient dimness of vision, or actual blindness, sometimes occurs from loss of blood, from excessive lactation, or from other exhausting discharges, and it commonly precedes the fainting state.

879. *Squinting*, when not permanent, is often due to affections of the brain, and is to be regarded as an unfavourable symptom. It is common in children as a consequence of disease of the brain attended by convulsions; and the permanent squint of the adult is often the result of an affection of the brain in infancy or childhood.

880. The state of the *pupil* is a symptom of considerable importance. As a general rule it is contracted in irritation of the brain, whether due to inflammation of the organ or to other causes, and it is also subject to extreme contraction in poisoning by opium and the Calabar bean. On the other hand the pupil is apt to be dilated in congestion of the brain without irritation, in hydrocephalus, in epilepsy, in some cases and stages of apoplexy, and in functional disorders due to remote causes, such as constipation and intestinal worms. It is also dilated in poisoning by belladonna, hyoscyamus, and stramonium, and by some other poisons belonging to the class of narcotico-acrids, as well as by the local application of the more active members of this class. The condition of the pupil is also an indication of the state of the retina. If it contracts freely under the stimulus of light, the retina has not lost its sensibility; if not, there is a loss of sensibility in the nerve, and, in certain cases, in the entire nervous system. When, in the absence of disease of the eye itself, the pupil of one eye is dilated while that of the other is contracted, cerebral disease may be presumed to be present. The state of the surface of the eye is used as a test of the state of the nervous system. If insensible to the touch, the nervous system generally may be assumed to be in the same state. Thus it is insensible under the full influence of chloroform, and in true epilepsy, but in the feigned disease responds to the touch.

881. *The sense of hearing* is subject to analogous affections with the sense of sight—to ringing sounds (tinnitus aurium), to distinct musical notes, and to puffing sounds like the noise of a locomotive. These may occur from slight and transient causes, and need not excite apprehension. But they may also usher in chronic or acute diseases of the brain. Of more marked illusions of the sense of hearing, something has been said at p. 109. The sense of hearing is generally acutely painful in inflammatory affections of the brain; and, in common with the sight, in the opposite state of the cerebral circulation; also in some cases of hysteria. *Deafness* is a common occurrence, and often a favourable sign, in febrile diseases, and in the febrile exanthemata. In some instances it is asso-

ciated with cerebral disease, and forms one of the group of symptoms by which it may be recognised.

882. *The sense of smell* is subject to illusions similar to those that affect the eye and ear; but the disorders of this sense have little significance as signs of disease.

The sense of taste has been already considered in § 842.

883. (*b.*) *Altered Muscular Action.*—The muscles are subject to paralysis, to convulsion, and to spasm. *Paralysis* may be local or general, of greater or less extent. It may affect the muscles of the tongue, or the muscles of the upper eyelid (causing ptosis), or several of the muscles of the eyeball (causing strabismus), or the muscles supplied by the facial nerve (causing palsy of one side of the face), or the muscles of one arm or one leg, or the muscles of one side of the body (hemiplegia), or the muscles of the lower half of the body (paraplegia). The loss of power may also vary in degree, being complete or incomplete. The cause of local paralysis may be either pressure in the course of the nerve supplying the palsied part, or disease of the spinal cord. As a general rule, paraplegia may be traced to injury or disease of the spinal cord, and hemiplegia to disease of one hemisphere of the brain. A local and limited palsy, traced to a nerve issuing from the base of the skull, becomes an important indication of cerebral disease, if accompanied by palsy of some part supplied by a nerve issuing from another foramen.

884. *Convulsive muscular actions* often afford important indications. Some distinctions worth bearing in mind are referred to at § 456. The convulsive actions most important to observe at the bedside are the twitchings of the muscles in low febrile attacks (*subsultus tendinum*), the picking at the bedclothes known as *floccitatio*, and the tremulous protrusion of the tongue. These symptoms only occur in cases which combine great weakness with much excitement of the nervous system; and they are highly unfavourable, though not fatal, symptoms. Convulsions are also common in infancy and childhood, and may be brought on by the irritation of teething, constipation, or worms. They are also present, sometimes as an early symptom, in hydrocephalus. In young persons they show themselves in the form of chorea or epilepsy; in adults in epileptic and hysteric seizures, in delirium tremens, uræmia, and in many kinds of poisoning. They may also occur on one side of the body, while the other is palsied. In sudden death from great violence, or from large doses of such active poisons as prussic acid, general convulsions, attended, as in epileptic fits, by expulsion of urine and fæces, precede death.

885. *Spasmodic actions of the muscles*, or prolonged and rigid contraction, occur in tetanus and hydrophobia; and in some forms of hysteria. They constitute the characteristic symptoms of poisoning by strychnia, and an occasional symptom of poisoning by some of the more active members of all the great classes of poisons. Similar rigid contractions of single muscles, or of groups of muscles, of long continuance,

attend organic disease of the brain, and constitute a very formidable symptom. Strabismus is one consequence of rigid contraction of a single muscle.

886. (*c.*) *Altered Mental Phenomena.*—These have been already treated of in a former chapter (p. 116); it only remains in this place to speak of that condition known as coma. *Coma* is a state of complete insensibility and loss of motive power. It may arise from several causes: from apoplexy; from such poisons as opium and carbonic acid gas; from drunkenness; from the operation of intense cold; from poisoning of the blood, as in uræmia; and from accumulation of serum in or on the brain. In distinguishing the coma of drunkenness from that of apoplexy we are assisted by the odour of the breath.

887. THE TEMPERATURE OF THE BODY.—This subject has recently attracted much attention both abroad and at home; and the investigations of Wunderlich, Parkes, and Ringer, confirmed by others, show that the use of the thermometer from day to day may furnish useful indications, both by coinciding with, and by somewhat anticipating, changes in the circulation as indicated by the pulse. Some observations on the high temperature attained in some febrile disorders will be found at p. 101.

888. (7.) THE EXPRESSION OF THE COUNTENANCE, AND THE CONDITION AND ATTITUDE OF THE BODY.—*The expression and aspect of the countenance* often afford great assistance in diagnosis, but it is not easy to convey a just idea of the physiognomy of disease by verbal description. The varieties of mental disease are strongly marked on the countenance. The wild excitement of mania, the deep despondency of melancholia, the vacant look of the idiot, imbecile, and demented, are familiar to all observers. Patients suffering from delirium tremens have often an air of extreme suspicion, and the habitual epileptic comes to wear a peculiar expression. Again, phthisis, emphysema, organic disease of the heart, diabetes, and Bright's disease, betray themselves to the experienced physician by the expression of the countenance; and hysteria is often detected by rapid transitions from tears to smiles, and by an appearance of health in bad keeping with the complaints of the patient.

889. *The condition of the body* in respect of nutrition and colour, and dryness or moistness of skin, always claim the attention of the physician. Rapid loss of flesh, or sudden corpulency, should equally excite attention. The one is common in such maladies as pulmonary consumption, diabetes, and organic disease of the stomach, as well as in diseases attended by profuse discharges; also in the decay of aged persons; the other may follow recovery from pulmonary consumption, or precede attacks of apoplexy. But corpulency in healthy persons may be due to a transition from active to indolent habits.

890. *The posture of the body* is often highly characteristic. It betrays loss of power in the paralytic, and weakness in the exhausted. The last stage of fever and of all exhausting maladies is marked by the help-

less attitude on the back; and the assumption of a position on the sides, such as is common in sleep, often affords an early and most welcome sign of commencing recovery from fever. The sitting or semi-recumbent posture, with the head raised by pillows, is highly characteristic of diseases directly or indirectly affecting the breathing, such as severe diseases of the lungs, and advanced diseases of the heart. The recumbent posture, with the legs drawn up, is equally characteristic of painful diseases of the abdominal viscera. In diseases of the chest we should note on which side the patient lies with most ease and comfort. As a general rule he lies on the diseased side of the chest; but the choice of position being determined in one case by a sense of pressure, in another by a sense of dragging, in a third by the ease with which the fluids gravitate to the air-tubes, and in many cases by several conditions combined, the inferences to be drawn from posture are less satisfactory than could be wished. In painful diseases of the abdominal viscera, the patient, as a general rule, lies easiest on the side of the disease.

CHAPTER V.

HYGIÈNE.

891. IN a large proportion of the cases that come under the care of the physician, both in private practice and among the poor, it is necessary to pay some attention to those circumstances which affect the general health of the patient, and to lay down rules for his guidance in matters that belong rather to the province of Hygiène than to the Practice of Physic. Indeed it often happens that the only remedial measures which the physician feels called on to prescribe consist of a change from bad to good habits of life, from an unhealthy residence or locality to a healthy one, from intense application to study or business to repose of mind and complete change of scene and occupation. In a certain class of cases, again, change of climate is the appropriate remedy, and the physician has to choose a locality suited to the disease or state of health of the patient.

With this regulation of the habits and residence of their patients, the hygienic duties of the greater number of medical men terminate; but there are duties of a larger and more comprehensive character in the right performance of which many medical men are directly interested—some as officers to such public institutions as workhouses, prisons, schools, hospitals, and lunatic asylums; some as officers in the army and navy, in charge of camps, barracks, ships of war, and merchant and emigrant vessels; others, again, as district officers of health.

The subject of this chapter may, therefore, be properly treated under the two distinct heads of *private* and *public* hygiène.

1. PRIVATE HYGIÈNE.

892. The principal matters which require to be regulated, with a view either to the preservation of health in the strong, or its restoration in the invalid, are diet, exercise, clothing, condition of dwelling, place of residence, and habits of life. *Diet*, as appropriate to persons of different ages, and as applicable to particular maladies and states of system, will be treated in the next chapter.

893. *Exercise*, regulated according to the state of the patient, is a very important therapeutic agent. It may be of two kinds—*active* and *passive*: in the one the patient moves about by the exertion of his own muscles; in the other he is borne from place to place. Walking, running, dancing, riding, rowing, fencing, boxing, wrestling, drilling, and all gymnastic exercises and active games, belong to the first class; riding at foot-pace, carriage exercise, sailing, rocking, and swinging, to the second.

894. Both kinds of exercise call the muscles into play, and promote the circulation of the blood; but in the passive form the muscles are only employed in maintaining the posture, while the circulation is quickened only by slight displacements of blood.

895. Besides the advantage of quickening the circulation, active exercises, by calling the abdominal muscles into play, promote the action of the bowels. Those exercises, too, whether active or passive, which are carried on in the open air, have the incidental advantage of supplying a purer air for respiration; and they imply a change of scene and occupation, which reacts favourably on the mind.

896. In prescribing the kind and amount of exercise the physician must be guided by the circumstances of each particular case. In the absence of organic disease, and when the patient suffers merely from general debility brought on by overwork, intense study, or too close attention to business, the choice of an appropriate exercise must be mainly determined by his circumstances and tastes. If practicable, change of air and scene, with the exercise which travelling implies, should be insisted on; and, where the strength allows of it, pedestrian exercise. A sea voyage is in these cases to be preferred to carriage exercise. When the patient is unable to quit the scene of his studies or business, horse exercise in the morning or evening of the day will be found most suitable; and this is especially the case with the inhabitants of large cities who cannot readily reach the country on foot. Fencing, rowing, quoit-playing, archery, and cricket have the double advantage of bringing all the muscles of the body into play, and of compressing a great amount of exercise into a small compass of time. Archery deserves encouragement as an exercise suited to persons of either sex.

897. For growing children of delicate health, exercise is of the utmost importance, and the active games of childhood may be combined with equestrian exercise and instruction in the graceful accomplishments of

dancing and fencing. In these cases much anxiety is often felt respecting the development of the chest, especially where a tendency to consumption is supposed to exist. With a view to promote this object, drilling, and the manly exercise of fencing may be strongly recommended for young men, and the nearest convenient approach to it for young women. It is greatly to be preferred to dumb-bells, to the clubs, or to other gymnastic exercises which consist of tedious repetitions of the same movements. Reading aloud, strongly recommended by ancient medical authorities, might be revived with great advantage; but in order to guard against the formation of habits injurious to the free play of the lungs, a judicious teacher should be engaged. Singing, properly taught, has the same recommendation.

898. In organic disease of the lungs or heart, all the stronger exercises, whether active or passive, are inadmissible, and walking on level ground is, in such case, the strongest exercise that can be safely prescribed. It is greatly to be preferred to almost any form of passive exercise except that of the carriage or garden chair. Running, or even walking at a brisk pace, and all athletic sports, are inadmissible. The more violent exercises, especially rowing in races, have often given rise to these diseases in persons having every appearance of strength and vigour. Gymnastic exercises, requiring prolonged and violent action of the muscles, are open to the same objection.

899. On the subject of *clothing* much misapprehension exists. There is a strong tendency towards over-clothing of the body, and especially of the chest, with a view of guarding against pulmonary disorders. A delicate patient is often made to wear, in the very height of summer, as many flannels and skins as would guarantee the temperature of the body in a polar winter, and in this way the very risk of catching cold, which it is deemed so important to avoid, is incurred. The same error is committed when, in addition to a load of bed-clothes, much exceeding what is required to preserve the proper temperature of the body, flannel is worn next the skin at night.

900. An opposite error is sometimes committed in very young children, under the erroneous notion of hardening them. At the other extreme of life warm clothing is highly necessary, especially in patients suffering from pulmonary affections; and great care should be taken in severe weather to keep up the temperature of the sleeping apartment throughout the night.

901. Young men who persist in wearing no other covering to the chest throughout the year but the linen shirt, and refuse to wear cotton or flannel next the skin in winter, are also in error. A thin cotton vest next the skin should be worn even in summer, especially by those who perspire freely. In hot climates cotton, in cold climates flannel, is the proper material for body-clothing. The importance of an immediate change after active exercise, or when the clothes are wet, need not be insisted on.

902. The *condition of his dwelling* is of great importance to the invalid. The points to be attended to in choosing a house, or in planning a residence, are chiefly the following:—

Site and Soil.—Where there is a free choice, a gravelly or chalky soil and sloping ground are to be preferred to a clay soil and low level site. A tenacious clay soil, a rich alluvium, or a dry surface soil with water at a short distance beneath, should be avoided, but especially the flat banks of rivers or streams, or the flat base of hills, as well as marshy spots, and the neighbourhood of stagnant water. The worst combination of site and soil is a flat alluvial deposit receiving the drainage of sloping grounds. Such spots are favourite haunts of continued fevers, as marshes are of agues; and good ground has been lately assigned for tracing many cases of consumption to the same cause.

Aspect.—In England a south aspect is to be preferred as being free from the extremes of heat and cold; and it is well suited to the invalid. A north aspect lacks both light and warmth. An east aspect has the advantage of the light and warmth of the morning sun, but is exposed to the cold drying winds of winter. A west aspect is open to the objection of being too hot in the after part of the day. In houses which can have only two opposite aspects, a south-east and a north-west are to be preferred. When there is perfect freedom of choice, a morning room to the east, the principal sitting-room to the south, with bed-rooms to the south for invalids and aged persons, and to the east for young and healthy ones, is a desirable combination. Dairies, larders, and store-rooms should be to the north.

Shelter.—Houses require shelter from the north and east; and when such shelter is not afforded by nature, it should be secured by plantations, which ought in no case be so near the house as to obstruct the free movement of air, or to endanger its foundations by the growth of roots. To the south and west the house should be open; but large trees at a moderate distance on the west side, afford a grateful shade from the heat in summer.

Water-supply.—A well, yielding clear, colourless water, and a tank to hold a supply of rain-water from the roof, amounting to at least ten gallons per head per diem for a month or six weeks, are great desiderata.

Drainage.—The soil on which the house stands should be thoroughly drained, and all offensive refuse promptly removed by impervious pipes properly trapped. Water-closets should be so placed that the drains may not pass under the house. In erecting places of convenience out-of-doors, the spots chosen should not be too near the dwelling, and the barbarous custom of digging deep cesspools should be avoided, especially in light soils, and near wells and springs. The proper construction is that adopted in many northern towns. A piece of ground should be rendered impervious to moisture by ramming or paving; on this the offensive matters and the slops from the house should be received, and the dust with the sifted ashes from the fires should be thrown upon them, through a hopper in the side. At short intervals of a fortnight, or month, the accumulated matters should be removed and thrown upon a compost-heap. These simple arrangements have the advantage of being both wholesome and economical. If the dust and ashes of the house prove insufficient, dry earth may be added; or the arrangement now known as the 'earth-closet' may be adopted from the first.

The preservation of dwellings from dampness is of the first importance. To accomplish this it is not sufficient to make the roof proof against the weather; the basement also must be attended to. The floor or pavement should be raised on dwarf-walls, supplied with air-bricks, and the house should be surrounded by an area or air-drain, so that the walls may be kept from contact with the soil. These precautions are especially necessary in clay and rich alluvial soils, difficult of drainage.

Light and Air.—Rooms should be lofty and spacious, and have open fire-places, and windows opening above and below. Staircases well lighted and aired by windows opening upon them, are to be preferred to those lighted by sky-lights, even when the lights admit of being opened. Pure air, especially in the bedroom of the invalid, should be guaranteed by the open fire-place. When the rooms are spacious, no special provision for ventilation is required beyond the facility of opening doors and windows. But small sleeping rooms require a constant provision for the renewal of the air by means of ventilators so constructed as to prevent drafts.

903. In order to preserve the health of delicate children, it is essential to provide for the free ventilation of their sleeping apartments. Overcrowding and consequent impurity of the air in such apartments is a common cause of disease in the children even of affluent persons, and a principal source of the high mortality of the children of the poor. In addition to the precautions for insuring thorough ventilation, a certain amount of space, approaching the thousand cubic feet insisted on in § 221, should be allotted to each child.

904. In cities, and even in rural districts, the external air admitted into the houses both of rich and poor is often very far from being sweet and pure. In the country the causes of impurity are few in number, being chiefly the gases from stagnant pools, ponds, or marshes, or the effluvia from cesspools, farm-yards, stables, pig-sties, or heaps of manure. These sources of impurity should always be placed at a distance from dwelling-houses; and in no case should they be in contact with them.

905. In large cities the sources of aërial impurity are much more numerous, and become doubly objectionable from narrow space and imperfect movement of the air. They consist in emanations from manufactures peculiar to towns, from the necessity of heaping up, at least for a short time, the dust and ashes of our houses, from the difficulty of consuming the smoke of our chimneys, and from the defects inherent in a large and complicated system of sewerage.

906. *Warming.*—This should be so effected as not to interfere with ventilation. Close stoves should, therefore, be banished from living or

sleeping apartments; their use being restricted to entrance halls, staircases, and large rooms only occasionally occupied. For living and sleeping rooms the best combination is an open fireplace of sufficient size and good radiating surface, with double windows, double panes of glass, or thick plate glass. In this way (especially when the walls of the house are thick, or double) any temperature that may be desired can be combined with complete ventilation. This mode of insuring a supply of warm pure air is of great importance in pulmonary diseases, especially in the bronchitis of aged persons.

907. Among the *habits of life* which militate most against health, and tend to counteract the best medical treatment, the chief are sloth, luxury, dissipation, indulgence in the pleasures of the table, the abuse of spirituous liquors, opium, and tobacco, irregularity in the time of taking meals and rest, and want of personal cleanliness.

908. For those whose constitutions have been undermined by sloth, luxury, and dissipation (Chap. I. § 84), travelling, and the wholesome observances of fashionable watering-places—early rising, regular hours for meals and exercise, the frequent use of baths, and cheerful and congenial society—are the only remedies which we have it in our power to prescribe. As intemperance and indulgence in the pleasures of the table are the besetting temptations of the same persons, there is perhaps no better way of guarding against them than by prescribing foreign travel, or a residence at fashionable watering-places.

909. When the abuse of spirituous liquors, opium, or tobacco is recognised as a cause of disease, steps should be taken to abolish these practices slowly and gradually, both on account of the greater safety of this procedure, and of the greater ease with which the patient may thus be made to lay his bad habits aside.

910. Irregularity in the time of taking meals and rest is an evil incident to the busy life of large cities, and one which we are often called upon to remedy by prescribing such improved habits as are compatible with the exigencies of the patient's business.

911. A want of personal cleanliness is more frequently chargeable against persons of education than might be expected. The practice of daily ablution of the whole body is observed by a comparatively small number of persons; but it is one to be commended as an excellent tonic, as tending to guard the body against catching cold, and as keeping the pores of the skin open. The warm bath should be occasionally employed to insure a more perfect cleansing of the skin. The practice of daily ablution with cold water, followed by friction with a rough towel, hair gloves, or the flesh-brush, is often of the greatest benefit to those who have an hereditary predisposition to consumption, or who have already manifested a tendency to it.

912. *Change of air or climate* is generally esteemed a most important means of preserving, improving, and restoring health. There are two classes of persons to whom it is usual to recommend the change.

The one consists of invalids who suffer from no defined disease, but whose general health has been impaired by exposure to one or other of the many unwholesome influences which attend a residence in large towns (see § 71 *et seq.*); the other comprises persons suffering from some well-defined malady, such as chronic dyspepsia, chronic rheumatism, scrofula, pulmonary consumption, chronic bronchitis, and asthma.

913. To the mere invalid, who has suffered by the cares and anxieties of business, the dissipation of a town life, or the *ennui* of an idle and useless existence, change of climate is chiefly valuable as affording facilities for change of habits, scene, and occupation. In advising such persons, little more is required than to avoid climates positively unhealthy, and to make choice of countries or places which offer the greatest facilities for change of habits and occupation; and in the case of the victim of *ennui*, the greatest inducements to exertion of mind and body.

914. In advising patients suffering from actual disease, a more exact knowledge of climate is required, at the same time that considerations of personal convenience will have to be carefully weighed. Assuming that there are no circumstances peculiar to the patient which render a change of residence inexpedient, the medical man will have first to consider the kind of climate best adapted to his disease, and then to select from a number of places having the required climate the particular one which is, on the whole, to be preferred.

915. In making choice of a climate, we may either consider the state of the patient's system, without reference to his disease, or we may be guided solely by the nature of his malady. The state of system may be either one of relaxation, characterised, if the disease affect any of the mucous membranes, by excessive secretion; if the glandular system, by indolent swellings or ulcers; if the skin, by chronic cutaneous affections; if the locomotive system, by chronic rheumatism and atonic gout. A cold skin, and a weak pulse, perhaps below the natural standard of frequency, with general languor of all the functions of the body, characterise this state. On the other hand, the state of system may be one of irritation, with a dry state of the mucous membranes, a harsh dry skin, and a frequent quick pulse, with a tendency to more acute forms of inflammation. In the state of relaxation, a dry bracing climate is indicated; in the state of irritation, a mild moist climate. In both, it is important to avoid a great increase of temperature as tending to exhaustion, sudden changes, as giving rise to cold and slight febrile attacks, and the east and north-east winds, as shown by experience to be peculiarly trying to the invalid. In chronic rheumatism, gout, and calculous disorders, a higher temperature appears to be advantageous. The climate of the East and West Indies, and of the Cape of Good Hope, is deemed suitable to this class of invalids.

916. As a general rule, the bracing spots adapted to a state of relaxation are those which are elevated, scantily wooded, exposed to the prevailing winds, and consisting of a gravelly or chalky soil; on the other hand, the mild moist climates are to be found in low situations, on clay

soils, wooded, and partially or wholly uncultivated, and sheltered from the prevailing winds. As a general rule, too, the climate of the seashore is milder and more uniform than that of the interior, being warmer in winter and cooler in summer. Watering-places have also the twofold advantages of pure sea-breezes and of sea-bathing.

917. Bearing these considerations in mind, it will be easy to point out, among the common resorts of the invalid, the places in England and abroad best adapted to the two opposite states of relaxation and irritation.

918. The mild sheltered places most resorted to on the English coast, are Undercliff in the Isle of Wight; Hastings on the south coast; Dawlish, Sidmouth, Exmouth, and Salcombe, on the coast of Devon. The sheltered spots in the islands of Guernsey and Jersey; Pau in the south-west, and Hyères and Nice in the south-east of France; Rome and Pisa in Italy; and Malaga in the south of Spain, offer the like advantages abroad. The islands of the Northern Atlantic (Madeira, the Canaries, and the Azores) and those of the Western Atlantic (the Bermudas and Bahamas) have the same mild relaxing climate.

919. On the other hand, the mild bracing spots adapted to a state of debility and relaxation without irritation, are, in England, Brighton, on the south coast; Torquay, on the coast of Devonshire; Clifton, on the western coast; in France, Montpellier; in Italy, Naples.

920. The places named in the two preceding sections must be understood to be intended chiefly for winter residence, the summer being spent inland in such places as Malvern, Cheltenham, Leamington, Tunbridge Wells, Matlock, and Buxton, in England; among the higher Pyrenees in France; or at the better situated spas of Germany.

921. The climate best adapted for residence during the entire year is perhaps that of Madeira, which to moderate fluctuations of a temperature little exceeding that of the milder parts of England, adds the advantage of a drier atmosphere, except during the autumnal rains.

922. The diseases in which change of climate may be expected to be most beneficial are emphysema, chronic bronchitis, asthma, and all those affections of the air-passages and lungs in which previous experience has shown that the patient suffers severely in winter and is comparatively well in summer. The efficacy of change of climate in pulmonary consumption is not so well established: but in the state known as tubercular cachexia (the presumed forerunner of tubercular deposit) as in other forms of cachexia, change of climate is advantageous. Whether a mild bracing or a mild relaxing climate is to be chosen must depend on the state of the system, whether it be one of languor and torpid action, or one of feverish excitement. (Consult, on this subject of Climate, Sir James Clark's able treatise.)

923. There are certain states of system in which it is expedient to combine with change of climate the alterative effects of minute doses of

saline or other substances in a state of solution; in other words, to select as the scene of the required change of climate, regimen, and occupation, some spot where access can be had to mineral waters. Such places abound both in England and on the Continent.

924. The *mineral waters* most in repute may be divided into four classes—*the saline*, *chalybeate*, *sulphureous*, and *acidulous*—to which may be added the *hot springs*. A short description of each of these classes, with the principal watering-places where they are found, will assist the physician in his choice.

(1.) *Saline Mineral Waters.*—These consist of variable quantities of the chlorides, sulphates, carbonates, and nitrates of potash, soda, lime, magnesia, and alumina, to which may be added, as of rare occurrence, free carbonic or sulphuretted hydrogen gas, the salts of iron in small quantity, with traces of phosphoric acid, iodine, and bromine. Sea-water is a concentrated form of this class of mineral waters. These waters act as gentle aperients, and are adapted to the case of patients suffering from dyspepsia, from habitual constipation, and from functional derangement of the liver. The waters of Cheltenham, Leamington, and Scarborough, in England; of Spital-on-Tweed, Pitkaithly, Airthrey, Dunblane, and Innerleithen, in Scotland; and of Ems, Carlsbad, Homburg, Seidschutz, Kreuznach, and Pülna, in Germany, belong to this class. Some of these mineral waters contain minute quantities of iodine and bromine, and, for that reason, commend themselves in scrofulous disorders, accompanied by glandular enlargements. The waters of Kissengen and Kreuznach contain the bromide of sodium in sufficient quantity (a third and a fourth of a grain in a pound of water) to have some effect if taken freely and continuously. The strongest waters belonging to this class are, in England, those of Cheltenham and Leamington; in Scotland, those of Airthrey; in Germany, those of Pülna, Seidschutz, Homburg, Kreuznach, Kissengen, and Marienbad.

(2.) *Chalybeate Waters.*—These contain variable quantities of the sulphate and carbonate of iron, and are, therefore, tonics specially adapted to the treatment of anæmia, and of functional disorders of the uterus. They are slightly stimulating, and require to be combined with aperient medicines. The waters of Tunbridge Wells and Harrogate in England, of Hartfell Spa and Vicar's Brig in Scotland, of Spa and Tongres in Belgium and the Low Countries, of Passy near Paris, and of Rennes in the south of France, belong to this class.

(3.) *Sulphureous Waters.*—These abound in free sulphuretted hydrogen gas, and are prescribed in several forms of cutaneous disorder. The waters of Harrogate in England, of Moffatt, Strathpeffer, and Rothsay in Scotland, of Enghien near Paris, of Barèges in the higher Pyrenees, of Aix and Leuk in Switzerland, and of Aix-la-Chapelle in Prussia, belong to this class.

(4.) *Acidulous Waters.*—These are characterised by the quantity of free carbonic acid they contain. They are more or less rich in saline ingredients; so that they might be placed with almost equal propriety with those enumerated in Class 1. The excess of free carbonic acid constitutes their claim to a place by themselves. They are applicable in the same cases in which saline waters are found useful, but, being more stimulant, they are better adapted to cases characterised by great debility. The chief mineral waters belonging to this class are those of Ilkeston in Derbyshire, of Kissengen, Marienbad, Auschowitz, Eger, Pyrmont, Spa, Fachingen, Geilnau, Seltzer, and Homburg in Germany; of Pougues, Mont d'Or, and Vichy in France; and the Saratoga Congress Spring in America. The waters of Carlsbad and Ems contain comparatively small quantities of free carbonic acid. The chief acidulous waters of Germany, classed according to the quantity of carbonic acid they contain, beginning with the richest, are—Geilnau, Pyrmont, Eger, Auschowitz, Spa, Fachingen, Homburg, and Seltzer. The waters of Homburg take the first place among the waters of Germany for combined richness in salts and free carbonic acid.

(5.) *Hot Springs.*—These are useful both as baths and as internal remedies. As baths they have the advantage of containing, like sea-water, but in smaller quantity, certain saline ingredients, which act as stimulants to the surface. Taken internally they have, according to their strength, the properties of saline waters. The principal members of this class are the waters of Matlock, Bristol, Buxton, and Bath, in England; of Carlsbad, Ems, and Wiesbaden, in Germany; of Baden in Switzerland; of Plombières and St. Nectaire in France. Some of these hot springs contain, in addition to saline substances, free carbonic acid and nitrogen.

925. The constituents of some springs are such as to give them a place in more than one class, and to entitle them to compound appellations, such as *saline chalybeates*, named from their combining the properties of saline and chalybeate springs. At some favourite watering-places, both in England and on the continent, several classes of mineral waters are to be found. Both Cheltenham and Leamington, for instance, have saline, chalybeate, and sulphureous waters; and Harrogate, in addition to strong and mild sulphur-waters, has its pure and its saline chalybeates.

926. There is no way in which most of the bad habits already referred to (§ 908) can be more effectually broken through than by a residence at some of the least frequented of continental watering-places. Those most frequented are often ill adapted to this end, as they combine the luxuries and temptations of large towns with the absence of those natural beauties which offer so wholesome an inducement to pedestrian and other exercises.

2. PUBLIC HYGIÈNE.

927. The saddest pages in the history of all nations are those which treat of the wholesale sacrifice of human life through ignorance or neglect of the simplest means of preserving health and averting disease. Such sacrifices have occurred in lying-in hospitals from insufficiency of space and neglect of ventilation; in foundling hospitals from the same causes, combined with absence of the mother's care and want of the

infant's proper nourishment; in schools from want of space, neglect of cleanliness, and insufficient and improper food; in workhouses and prisons from the same causes, added to idleness, listlessness, and depression; in civil hospitals chiefly through want of space; in military hospitals from the same cause, added to the want of proper medical attention and nursing, and sometimes of proper food and medicine; in emigrant and transport ships, and men-of-war, from narrow space, foul air, bad water, and bad food; in armies in the field from ill-chosen encampments, bad provisions, overcrowding, neglect of cleanliness, and intemperance. Convulsions, infantile tetanus, and gangrene of the mouth; marasmus; puerperal fever; Asiatic cholera; jail fever; typhus, relapsing fever, 'parish infection,' and 'the sickness of the house;' scurvy; diarrhœa and dysentery; ophthalmia; malignant ulcer and hospital gangrene—have all been traced to such causes; while all epidemic maladies, small-pox, plague, sweating sickness, black death, and cholera, have committed their worst ravages among men, women, and children crowded together, and wanting one or more of the simple requisites of pure air and water, cleanliness, due shelter, efficient drainage, appropriate clothing, and wholesome and suitable food.

928. It is no disparagement to the art of healing to say that more lives have been sacrificed to neglect of the simplest means of preserving health than can have been saved by the most skilful medical and surgical treatment. It is of the first importance, therefore, that the physician should understand and be able to recommend with authority the measures to be adopted to preserve the health of men, women, and children when of necessity congregated in large numbers. These measures might, indeed, be inferred from what has been said in this chapter on diet, exercise, clothing, condition of dwelling, place of residence, and habits of life, and, in the earlier chapters of this work, on the causes of disease; but the precepts thus laid down for individuals require to be modified in order to meet the cases of men, women, and children in the aggregate.

929. Of foundling hospitals, for the reception of infants, it is not necessary to say more than that they are as indefensible on physical as on moral grounds, and that it would be a waste of time to point out the means of reducing the mortality to which they must be subject. The same observation applies, though not with equal force, to lying-in hospitals. The danger of congregating large numbers of puerperal women within their walls is obvious, and can only be averted by a largeness of space and freedom of ventilation to which the expense must always be a serious obstacle.

930. Of schools, it will suffice to remark that the contagious maladies to which children are subject render an observance of all the rules of health presently to be laid down for adults doubly necessary.

931. To prisons attaches the necessary drawback of confinement at an age when the desire for active employment is at its height. The younger inmates of workhouses share this evil with prisoners; and it is not to be doubted that when, to the evils of confinement in the case of

the healthy, are added those of sick-wards with inadequate accommodation, limited space, and a scale of expense adapted, of necessity, rather to the means of the poorer ratepayers than to the strict necessities of the case, workhouses have always been, and must continue to be, highly destructive of life.

932. Sailors on board ship, and soldiers on service, are exposed to special disadvantages; sailors, to unusual narrowness of space, and to close confinement in rough weather, often combined with bad water, scanty and unwholesome food, and great exposure and fatigue; soldiers, to the same evils, in nearly the same degree, and the superadded disadvantage of equal exposure to the weather, with less shelter, encampment on unhealthy spots, and prolonged occupation of badly-selected sites for barracks and hospitals.

933. In treating of the means of preserving health and preventing disease among bodies of men there will have to be considered: 1. The case of persons confined within such buildings as prisons, workhouses, and barracks. 2. The case of the sick in hospitals. 3. The special case of persons living for a time on board ship, as sailors and emigrants. 4. The case of sailors and of soldiers in actual warfare.

934. 1. The means of preserving the health of persons confined within such buildings as prisons and workhouses are those already described in the beginning of this chapter as applicable to individuals and families, with a few obvious modifications. The buildings should be so constructed as to combine a healthy site and suitable aspect with good water supply, thorough drainage, spacious living and sleeping rooms, facilities for oversight and inspection, and ground for exercise and wholesome labour. The portions of the structure requiring drainage should be placed on the skirts of the building in such a manner as to obviate the necessity of carrying the drains under the building itself, and the earth-closet may be used with advantage. The walls should be surrounded by air-drains; the lower story of the building should be so constructed that the floor shall not be in contact with the soil; the purity of the air should be provided for by a space in living and sleeping rooms falling little short of 1000 cubic feet, and warmth and ventilation conjointly by open fireplaces, and windows, glazed with thick glass, or with double panes of common glass, and opening above and below. In prisons, warming by hot air, hot water, or steam, and ventilation by mechanical aids, cannot well be dispensed with. In all other buildings these modes of warming and ventilating are highly objectionable, except for passages and halls, and for rooms occupied only occasionally, and for short periods of time. Scrupulous cleanliness is to be insisted on, not merely for its own sake, but for the occupation it gives; facilities for exercise have not merely to be afforded, but exercise itself to be organized and superintended; and the greatest care should be taken that the diet of the inmates consists of a due proportion of animal and vegetable substances, from which vegetables or cheap fruits containing a vegetable acid, or such an acid in combination with an alkali, should on no account be omitted. This

precaution requires to be especially borne in mind when the potato, which answers this description, falls short.

935. 2. Hospitals, in common with buildings tenanted by bodies of healthy persons, should combine a well-selected site, a dry soil, thorough drainage, a suitable aspect, a compact arrangement of rooms and passages favourable to efficient oversight and easy communication, and an economic system of warming and ventilation. The remarks already made on site, soil, and drainage, as applicable to houses, apply equally to hospitals, and a few additional words on the subject of aspect will supply all that is required on this head.

The best aspects for the wards of an hospital are the north and south, or the north-west and south-east. The east and west aspects combine the advantages of greater cheerfulness with the drawback of the sun's glare; and the west aspect is open in summer to the objection of great heat in the after part of the day. The south aspect is the best for consumptive patients, for those suffering from diseases of the lungs, for weak and delicate persons, and for the aged. In hospitals restricted to two aspects, the direct north and south are preferable to the direct east and west. In general hospitals with a north and south aspect, the southern wards are most suitable for diseases of the chest, for aged persons, and for the weak and delicate; the northern wards for febrile and inflammatory disorders. For convalescent hospitals, the greater cheerfulness of the east and west aspects is a recommendation. The airing grounds attached to hospitals should have a southern exposure. Dispensaries and rooms for the examination of patients should face north and south, and larders and provision-stores north.

The most economical arrangement of an hospital is one which devotes the basement to the out-patient department, the dispensary, the living and sleeping rooms of nurses and subordinate officers, the kitchen and stores.

A compact arrangement of rooms and passages is best obtained in a lofty building with a large central staircase; and the most economical as well as least objectionable arrangement for warming and ventilating is obtained by a combination of open fireplaces with the thick walls of a lofty building, and windows glazed with thick glass, or with double panes of thin glass, and opening freely above and below, or tilting inwards in three or more sections. The air of the great central staircase should be warmed by open fires, and be available in bad weather for the ventilation of the wards.

As the wards of an hospital are occupied by sick persons day and night, the cubic contents per bed should be half as great again as in prisons, workhouses, and barracks. For adult males, and in the case of hospitals in London and the large provincial towns, it should not fall short of 1500 cubic feet; and in fever hospitals and lying-in wards should amount to 2000. A considerable reduction of space may be made in the case of women and children, and of hospitals in open situations in the smaller provincial towns.

The wards of an hospital should be lofty as well as spacious. They should have a height of 14, 15, or 16 feet, and such length and width as to give ample space round the beds. The beds arranged along the outer walls should stand each in a pier between two windows, and those of inner walls, opposite to them, and the corner beds should not touch the end walls. The windows should rise to within a short distance of the ceiling, and open above and below. The number of beds in a ward must vary with the kind of cases admitted. In civil hospitals, thirteen or fifteen beds in a ward are convenient numbers, especially as admitting of symmetrical arrangement; in military hospitals, thirty beds is the number generally preferred. For an equal number of nurses or attendants, the number of beds in a ward will decrease with the severity of the cases, and *vice versâ*.

The same principles of arrangement and construction apply to military as to civil hospitals. Of camp hospitals, or of buildings used for soldiers in actual service, it may suffice to observe that the roughest weatherproof shed, provided it be spacious, is to be preferred to the most substantial building if overcrowded. This truth, distinctly proved by Dr. Brocklesby, is one which should never be absent from the mind of the army surgeon.

936. 3. A ship on the open sea has the solitary advantage of being surrounded by a pure air free from injurious terrestrial emanations. In all other respects it is placed under unfavourable circumstances; for it combines the drawbacks of inadequate space for passengers and crew, and stowage of water and provisions; of ventilation liable to frequent interruptions; of a moist atmosphere acting on vegetable matters subject to decomposition; and of the frequent incursions of a water abounding in salts (the sulphates), which by decomposition evolves sulphuretted hydrogen gas. A ship in harbour, though in other respects better circumstanced, is often exposed to the most deleterious emanations from low swampy lands and rich alluvial soils. A seafaring life, moreover, is exposed to great and continuous fatigues under circumstances otherwise unfavourable to health, and to a certain extent, and often for long periods of time, to the evils of a monotonous existence. Hence the health of seamen and passengers by sea can only be preserved by the most watchful care and attention to the cleanliness, dryness, and ventilation of the ship, the supply of fresh water, and of sound provisions embracing all the elements of a wholesome diet, with suitable clothes, and proper change of clothing, and with fitting exercise, occupation, and recreation. To these must be added facilities for separating the sick from the healthy.

The means to be adopted to insure these ends can only be fitly described by those who add to a general knowledge of the principles of hygiène a special acquaintance with the construction and internal economy of ships.

937. 4. The preservation of the health of soldiers and sailors in actual warfare is a subject which can only be adequately treated in works specially devoted to it. Men engaged in offensive wars are exposed at the same time, or in quick succession, to every cause of disease except

inactivity of mind and body; and even from this they are not always exempt. They are often called on to serve in unhealthy climates and pestilential places, in inclement seasons, with inadequate shelter, or with no shelter at all, with short supplies of provisions, rarely of the best quality, and from which some important elements of a wholesome diet are almost necessarily omitted, exposed to every species of hardship and privation, to fatigue and want of rest, and they are sometimes tempted to dangerous excesses of riot and intemperance. When serving at a distance from home, they often enter on a campaign with health impaired by the confinement of a long sea voyage, and must often remain in garrisons and encampments combining the most unwholesome sites with the most imperfect sanitary arrangements. Under such circumstances a close attention to all the known means of preserving health and preventing disease becomes imperatively necessary. Some of the leading precautions and provisions applicable to the soldier in service may be briefly stated.

In transporting troops from place to place the same watchful care is required on board ship as in the case of sailors and passengers; and when it is possible to choose the time of year, that should be selected which will enable the soldier to arrive at his destination at the healthiest season, and one bearing the nearest resemblance to his native climate. His *clothing* should be suited to the climate and season, being of close-fitting woollen materials in cold climates and in winter; of cotton, sitting loose, and with protection for the head, in hot climates and in summer. In winter, flannel should be worn next the skin; in summer, cotton. A warm waterproof cloak for wet weather and night use, and strong thick shoes well fitted to the feet, with thick woollen socks, complete the necessary clothing of the soldier. In all places, and at all times, mere soldierly appearance and bearing should give place to comfort and practical efficiency. The best *bedding* for the soldier is a mattress stuffed with cork, covered beneath with waterproof cloth, and having a double flap of the same material to draw over the body. The soldier's *diet* should be as carefully adapted to the climate as his dress. In cold climates a full supply of animal food should be provided, and spirituous liquors are least injurious; in warm climates an excess of vegetable food, and an abstinence from spirituous liquors, should be enjoined; in both, vegetables and ripe fruits, or their nearest substitutes, ought on no account to be omitted. The soldier on the *march* should be in motion during the hours most suitable for exercise, and for avoiding the intense heat of warm climates. He might always advantageously walk one or two miles before taking his first meal; then, after rest and refreshment, enter on the principal portion of the day's march. The best food for the first meal is warm nutritious soup, or hot coffee with bread; and tea is always a grateful refreshment. The ground chosen for *encampments* should, if possible, be sloping, so as to allow of natural drainage, protected from cold winds, and, in hot climates, affording the shelter of trees. Places for the deposit of offensive matters should be chosen in reference to the prevailing direction of the wind. They are best placed on a sloping bank, upon which dry earth should be thrown day by day; the mixed soil being removed at short intervals to a convenient distance. Soldiers should not remain on the same spot for any length of time, but the site of the camp should be changed at short intervals. Proper arrangements should always be made for separating the sick from the healthy; and, in providing tents, or huts, or more substantial buildings for hospitals, the principle already laid down should be constantly borne in mind, that the roughest shelter, with plenty of space, is preferable to the most substantial building without it.

Soldiers in *cantonments or barracks* often suffer severely through the selection of an improper site. Instead of being stationed on high sloping ground, some low-lying swamp at the mouth of a river is chosen, with the certain result of excessive sickness and a high mortality. If to this first fatal error there be added a similar neglect of other hygienic precautions, the results are lamentable. If, on the other hand, a good choice of site is followed up by careful attention to all the simple rules of health, the soldier's life may be preserved even in the unhealthiest climates.

In cantonments and barracks, and on the march, as far as the exigencies of actual warfare will permit, the following precautions should be carefully observed. The soldier should be sheltered, as much as possible, from the heat of the day, and from the cold and dews of the night; dry, healthy spots should be chosen for military exercises; military duties should be so timed that the soldier may be deprived as rarely as possible of his natural sleep; in mounting guard arrangements should be made to employ as few fatigue-parties as possible; the messes should be so ordered that the soldier may begin the duties of the day with a comfortable warm breakfast; the diet should always comprise a due supply of vegetables and ripe fruits, and the canteen should be placed under stringent regulations; the means of personal cleanliness should be provided, and daily washing of the feet and frequent bathing be insisted on; flannel waistcoats or cotton shirts should be worn next the skin, and a flannel belt round the loins; and a change of clothing should be provided and ordered after every exposure to rain. The soldier should also be subject to frequent medical inspection, especially during the prevalence of epidemics; and he should be encouraged to engage in manly sports, should be employed to the utmost in useful and cheerful labours, and in studies calculated to occupy and amuse the mind.

The subject of Public Hygiène would be incomplete if some notice were not taken of the *dietaries* adapted to preserve the health of men, women, and children when brought together in large numbers. A separate section may also be advantageously devoted to the subject of purification of air, water, and animal excretæ, to deodorants, disinfectants, and antiseptics.

3. DIETARIES.

938. The great pestilences of former times were always preceded or attended by famine or scarcity; and a deficiency of food, or a failure of some important crop, such as the potato, has proved the immediate forerunner of the most fatal outbreaks of fever in more recent times.

Moreover, the relation which scarcity of food bears to one form of fever is so marked as to have led the best modern authorities to speak of it as "Relapsing, or Famine Fever."

939. Scarcity of food, or the lack of some important element of a wholesome diet, has also given rise to many fatal maladies among soldiers in active service, and especially those engaged in the attack or defence of besieged places, as well as among seamen.

940. The same cause has also been in occasional operation in all establishments for the reception of healthy and sick persons—in schools, prisons, and workhouses, in barracks, and in hospitals; and some notable and instructive examples of the danger attending large reductions in existing dietaries, and the omission from the diet-roll of such an important element as the potato and its vegetable equivalents, have been afforded within the present century. One of the most painfully instructive of these cases occurred at Millbank prison in 1822; and some instances on a smaller scale in other prisons still more recently.

941. The principal diseases which have been traced to scarcity of food, or to food of an improper character, are scurvy (purpura nautica and purpura hæmorrhagica), dysentery, and diarrhœa, continued fever, and scrofula; in infants, the disease known as tetanus neonatorum; and in children, marasmus. All those maladies, bodily and mental, which follow upon gradual exhaustion of the strength, and impairment of the constitution, are also promoted by the same cause.

942. Of the diseases just specified the one which is most certainly produced by an insufficient diet, but especially by one from which vegetables are excluded, is the scurvy—a disease which fortunately marks its presence not merely by extreme weakness, but by the characteristic swollen, spongy, and bleeding gums, the pouring out of blood in circular spots (petechiæ), or in irregular blotches beneath the skin, and hæmorrhage from the mucous surfaces.

943. In devising suitable dietaries for the inmates of public establishments, or for other bodies of persons, many circumstances must be taken into account, such as age and sex, occupation and manner of life, health and sickness, and the necessity, or otherwise, of economy. So large a subject can only be worthily treated by entering into details which would be out of place in this work; but a few general principles applicable to all persons alike, and subject to modifications in accordance with age and sex, health and sickness, and the demands made on the strength by different conditions and occupations, may be usefully laid down, relating to:—1. The constituents of a wholesome dietary. 2. The proportions in which those constituents should be given. 3. The quantities required by adults of either sex, and by children of different ages. And 4. The variations in quantity necessitated by condition and occupation.

944. 1. *The constituents of a wholesome dietary* have been determined partly by experience and partly by inference from chemical ex-

amination of the blood, structures, and excretions of the human body, on the one hand, and of different kinds of food on the other. Experience has taught us the necessity of blending in the same dietary more than one kind of food; and has warned us in language not to be mistaken, of the danger of omitting from any dietary for any length of time that vegetable element of which, in consequence partly of its abundance and partly of the convenience with which it may be stored and kept, the potato is the best representative. By chemical analysis of the blood and animal structures, we have been taught that the body cannot be built up, nourished, and maintained in health and vigour without such mixed food as shall supply it with the nitrogenous elements of muscle and skin, the carbonaceous element of fat, and the several mineral matters which enter so largely into the composition of bone, and furnish an essential element of the nervous tissue. Chemistry has also taught us that of the excretions, some (as the exhalation from the lungs) abound in carbon, others (as the urine) in nitrogen and saline matters. On the other hand, we have been taught, by the same science, that all the elementary constituents of the blood and tissues, and all the solid and gaseous elements of the excretions, exist in the food which we consume and the air we breathe, and can be traced to them; and, further, that it is possible to arrange all the varieties of food in two great classes, according as they contain or do not contain nitrogen (§ 167), the non-nitrogenous class subserving the function of respiration, and contributing largely to the production of heat; the nitrogenous or plastic class, employed in building up, maintaining, and repairing the tissues of the body.

945. The chemical analysis of the milk by which young animals are nourished, and of the egg which performs the same office for birds, confirms the information derived from the sources just indicated; for the solid matter of milk consists of more than a third of its weight of the nitrogenous element, caseine; somewhat more than a fourth of the carbonaceous material, oil or butter; and less than half of another carbonaceous element, sugar: these, with about a hundredth of its weight of mineral substances, of which by far the larger portion is phosphate of lime, being held dissolved or suspended in about eight times their weight of water. Here we have a nitrogenous or plastic element (caseine), combined with carbonaceous elements in the proportion of about one to three. In the egg, again, the nitrogenous element, albumen, in the proportion of about seven parts, is blended with oily matter (a small quantity of sugar only being present) in the proportion of five parts, these matters being mixed with about three times their weight of water.

Again, chemical analysis of the vegetable substances which experience has proved to be preventives of scurvy, have shown that it is not by virtue of their carbonaceous or nitrogenous constituents that they so act, but by means of a vegetable acid (the citric or malic), free, or combined with potash.

946. It follows, then, from the teachings of experience, and the researches of the chemist, that a dietary to be *wholesome* and *nutritious* must contain a combination of nitrogenous or plastic, and non-nitro-

genous or respiratory, elements, together with vegetables known to contain a free acid, or such an acid in combination with potash.

947. Now, some articles of food in common use are rich in nitrogen, others in carbon, and others, again, contain both elements blended in proportions approximating more or less closely to the actual requirements of the frame. So that it is quite possible to construct wholesome and nutritious dietaries by very different combinations of food. One diet may have milk for its chief element, another the flour of wheat or other cereal, another meat, another fish, another the potato. In India rice is the staple of diet, in Ireland the potato, in Scotland oatmeal, in England the flour of wheat.

948. For practical purposes the substances most used in the dietaries of this country may be classed as nitrogenous, carbonaceous, and mixed —the first group consisting of meat, cheese, and pease; the second of suet, bones, and molasses, rice, and the potato; and the third of milk, and the flour and meal of wheat, oats, barley, and maize. The common vegetables which contain a free acid, or an acid in union with potash, are potatoes, turnips, and carrots. Cabbage and onions have the same antiscorbutic property, but with a nitrogenous element. Milk also has the same valuable property, in virtue of the free acid which sometimes exists in it, and which is always readily produced by fermentation.

949. The cheapest articles which may be readily and abundantly procured in this country are:—among the nitrogenous group, shins of beef (meat and bone together for soup), butter-milk and skimmed milk, and pease; among the carbonaceous group, bones, suet, molasses, potatoes, and rice; and among the mixed group, Indian meal, barley-meal, oatmeal, and wheaten flour.

950. This grouping has no pretence to scientific accuracy; for, with the exception of suet and molasses, the rest consist of combinations of the nitrogenous and carbonaceous elements in different proportions, the nitrogenous group having a larger proportion of nitrogen, the carbonaceous group of carbon, and the mixed group the two elements in proportions which peculiarly fit them to become the substantial centre or basis of a wholesome and nutritious dietary.

951. These elements of a cheap dietary are very variously combined in actual practice. Indian meal and oatmeal are usually mixed with milk into a pudding or porridge; suet with wheaten flour into a pudding; the bones and flesh of the shin of beef with onions, carrots, and pearl-barley, into a nutritious soup; bread is eaten with cheese; and the potato, in the best devised dietaries, forms a part of every dinner.

952. 2. The proportions in which these, the chief constituents of a wholesome dietary, ought to be blended, have been ascertained with some approach to accuracy by a chemical comparison of the food consumed and the excreta discharged, by adult males of the well-fed class most readily submitted to experiment. If Dr. Dalton's experiments on himself might be taken as a standard, it would follow that an adult healthy

male ought to be supplied with articles of food containing about eleven and a half ounces of carbon and an ounce and a half of nitrogen (§ 257). The nitrogen should, therefore, bear to the carbon the proportion of about one to seven, or one to eight. Vierordt expresses the wants of the adult frame somewhat differently. He says that an adult male, to keep in good condition, requires about four ounces of albuminous matter, nearly three of fat, and about ten and a half of amylaceous food daily. One pound of wheaten bread, one pound of potatoes, and about four ounces of meat, or its equivalent in nutritious meat-soup or cheese, per diem, would fairly meet this requirement. If it were deemed expedient to exclude the meat element, one pound of bread, half a pound of potatoes, half a pound of oatmeal, and seven pints of milk per diem, would similarly meet the theoretical requirements of the German physiologist.

953. By very general assent it has become the practice in England to supply to paupers and prisoners a dietary consisting chiefly of bread, potatoes, and meat, soup containing meat, and gruel for breakfast. A liberal, but not excessive, diet for men not at hard work might be roughly stated to consist of about 275 ounces per week of food served in the solid form, and about fourteen pints in the liquid form; while for men at hard labour the quantity of solid food is generally found to exceed 300 ounces per week, the liquid food being still about fourteen pints.

954. The quantities of food required by adult men and women, and by children respectively, are not easily ascertained. One obvious consideration arises out of the weight of the classes to be provided for. Thus, the weight of an adult woman being about a sixth less than that of an adult man, it would be reasonable, if all other things were equal, to deduct a sixth from the dietaries of adult males, in order to adapt them to the use of adult females. But as the work of nutrition goes on less actively in women, and the wear and tear of their system is less, the deduction may perhaps be roughly represented by a fourth of the food served in the solid form. So also, as the weight of men or women at sixty-five or seventy years of age is about a twentieth less than the weight of adults, and their functions much less active, it would not be unreasonable to reduce the dietary of aged persons by at least a tenth.

955. The case of children offers greater difficulty; but here, too, the element of weight cannot be disregarded. A child five years old will weigh about a fourth, a child of seven about a third, and one of fourteen not much more than the half of an adult of the same sex; but as the child is growing, it is obvious that it requires, in comparison with the adult, a quantity of food not to be measured by the weight alone. Hence, instead of a fourth, a child of five years might require a third of the food given to the adult, a child of seven might require a half, and a young person of fourteen as much as two-thirds. Assuming the weekly diet of an adult to be 300 ounces of solid food, consisting chiefly of bread, potatoes, and meat, the solid constituents of the dietary of the Foundling Hospital, as given by Pereira, would amount for children under nine years to about five-twelfths, and above nine to about seven-

fifteenths. The liquid portion of the food in these dietaries for children consists very properly of milk. In adult dietaries milk is used exceptionally.

956. 3. Of the variations in the quantity of food rendered necessary by condition of life and occupation, it may suffice to observe that, as a general rule, inaction of mind and body imply a moderate allowance, and activity of mind and body a liberal supply; that bodily exertion necessitates an increase, and bodily inaction a decrease of the nitrogenous or plastic elements; and that a liberal supply of the vegetable element, of which the potato is the most convenient representative, is specially needed in men or women who lead an inactive life within doors. It is believed, too, that convicts, in consequence partly of their long confinement, and partly of the depressing effect of imprisonment, require a more liberal diet than paupers; and that convicts with long sentences must be better fed than prisoners whose term of retention is shorter. It is probable that as the depression produced by imprisonment has been over-estimated, so also has the need of a more sustaining diet; and it is quite possible that an increase of the vegetable (potato) element would meet this exceptional case better than an absolute increase in the quantity of the food.

4. DEODORANTS, DISINFECTANTS, AND ANTISEPTICS.

957. The medical man may have to give advice as to the choice and use of these agents in the sick-room, when it is not possible to resort to a thorough draft of air to sweep away the offensive odours emanating from the patient or his *excreta*, and in cases of fever or the febrile exanthemata, in order to render inert or harmless the contagious matters which float in the air, or attach themselves to clothing, bedding, and furniture. He will also naturally be consulted respecting the purification of air, water, and offensive refuse matters; and, if officially engaged in the prevention of disease, the ordering of such works of purification will constitute no inconsiderable part of his duties.

958. In treating this subject, the chief deodorants, disinfectants, and antiseptics, will first be named and classified, and then those among them which are best adapted for special purposes will be pointed out.

959. 1. *Deodorants*, or agents which remove, or destroy, odours. These are either dry solid matters (such as charcoal, lime, earth, or ashes) which act by absorbing, or combining with, the water and gases of the odoriferous material; or, 2. Inodorous saline solutions, of which the acid, the base, or both, combine with some element of the gas or gases to which the material owes its offensive properties (such as permanganate of potash, chloride of zinc, perchloride of iron, nitrate of lead, sulphate of iron, and the mixed sulphates of zinc and copper; or, 3. Salts, and their solutions, which readily give off gaseous matters (such as the chlorides of lime, potash, and soda, which yield chlorine); or, 4. Liquids giving off acid vapours which combine with the ammonia of the sulphide and other ammoniacal compounds (such as vinegar and pyroligneous acid); or, 5. The gases, chlorine, iodine, bromine, ozone, nitrous,

and sulphurous acids, and ammonia. The smoke of coarse brown paper, of cascarilla bark, of benzoin, of juniper berries, of pastiles, &c., is to be considered as concealing rather than correcting offensive odours, and is not, therefore, rightly classed among deodorants. The vapours of burning tar or pitch, and those perhaps of the resins generally, may, however, be rightly admitted into the class, as well as the smoke of burning paper saturated with nitrate of potash.

960. 2. *Disinfectants*, or agents which destroy infectious matter. This class is smaller than the foregoing, and comprises only a few of its more active members; and the efficiency of some of them is rather inferred from their known chemical activity than proved experimentally; for the exact nature of infectious germs is as yet unknown. The most approved disinfectants are—*a. Heat.* A temperature of 212° Fahr., applied as hot air, steam, or water, during the space of from half-an-hour to an hour effectually destroys infectious matters.—*b. Chemical vapours.* Among deodorants those that are most likely to answer the purpose of disinfectants also are chlorine, bromine, and iodine, ozone, and nitrous, hydrochloric, and sulphurous acid gases.—*c.* The tar acids (carbolic, cresylic, and creasote), of which *Carbolic acid* is the most efficient. The researches of the Cattle Plague Commission of 1866, conducted by Dr. Angus Smith and Mr. Crookes, have issued in proving the undoubted superiority as disinfectants of sulphurous acid gas, generated by burning sulphur, and carbolic acid more or less diluted with water. The choice was understood to lie between these and the powerful oxidizing agents, chlorine and ozone, and the former were preferred.

961. 3. *Antiseptics*, or agents which arrest or prevent fermentation and putrefaction. The most efficient members of this class are—*a.* a high or low temperature, as of 212° Fahr. on the one hand, and 32° Fahr. on the other.—*b.* Sulphur-fumes and carbolic acid, as proved by the researches just referred to.

962. In making choice of one or other of these agents in special cases, we must be guided by the character of the material to be cleansed or purified. In empty rooms or buildings, or for the cleansing of floors or walls, burning sulphur, strong solutions of carbolic acid, and the several substances which give off bleaching or corrosive acid fumes, may be freely employed: they are less applicable to rooms containing furniture. The dry deodorants—charcoal, lime, earth, ashes, and sulphate of iron,—are specially applicable to feculent discharges, as is also the permanganate of potash in solution. Water containing animal matter may be treated with a dilute solution of permanganate of potash, and water which owes its hardness to bicarbonate of lime held in solution, may be softened by the use of milk of lime. The air of sick rooms may be purified by the chlorine given off from the moist chloride of lime, or by solutions of the permanganate of potash freely exposed on cloths moistened with it. The odour of feculent matters diffused through the sick-room quickly disappears on burning coarse brown paper saturated with nitrate of potash. The common disinfectants are sold in shops, with directions for use.

CHAPTER VI.

GENERAL THERAPEUTICS.

963. The Science of Therapeutics treats, as the name implies, of the cure and palliation of diseases. In its widest sense, it comprises all information having a direct bearing on the knowledge of disease, on the one hand, and of remedies on the other. The application of this knowledge constitutes the *Art* of healing.

964. The art of healing is beset by the same difficulties that attach to the study of disease, and by others peculiar to itself. As our imperfect acquaintance with the phenomena of health limits our knowledge of disease, so our scanty knowledge of the action of remedies on the healthy frame is an obstacle to the successful treatment of disease. But still greater obstacles result from the difficulty of instituting comparative trials of different modes of treatment in the same disease, and our ignorance of the extent to which the body, if left to itself, would repair the injuries which it sustains. We cannot leave disease to itself; hence we are ignorant of the power of the "vis medicatrix:" and we are reluctant to employ a new remedy in a disease in which an old one is used by general consent, lest an unsuccessful or fatal result should be laid to our charge.

965. To form an exact classification of remedies, or to establish broad principles of treatment, is, therefore, a work of great difficulty. What we know on the subject will be best explained by taking the principal functions of the body, as described in a former chapter, and showing the effect of remedies on each of them in turn. In pursuance of this plan, the following arrangement will be adopted:—

(1.) Remedies applicable to disorders of the primæ viæ, including the treatment of those of the stomach, liver, and intestines. (§§ 142 to 188.)

(2.) Remedies which modify the composition of the blood. (§§ 189 to 258.)

(3.) Remedies which affect the circulation and the functions of the several orders of vessels. (§§ 259 to 361.)

(4.) Remedies which act on the structures of the body. (§§ 362 to 406.)

(5.) Remedies which act on the nervous system. (§§ 407 to 466.)

(6.) The duties of the nurse and the management of the sick-room.

1. REMEDIES APPLICABLE TO DISEASES OF THE PRIMÆ VIÆ.

966. *Diet.*—Most disorders of the stomach require regulation of the diet, and directions as to the time and mode of taking food. The most common functional disorder is anorexia, or loss of appetite, attendant on almost all severe diseases, especially those of an inflammatory or febrile character. It always indicates a loss of power to digest food, and necessitates either entire abstinence, or the use of such articles of diet as are least irritating to the stomach; such as barley-water, toast-water, milk-and-water, and weak tea; acidulated drinks, such as lemonade and imperial; and the ripe juicy fruits, especially the orange and grape.

967. The functional disorders of the stomach which originate within the organ itself, are known as acute and chronic dyspepsia. The *acute* form requires a diet free from all matter which can irritate the tender membrane of the stomach; such as gruel, arrow-root, or sago, made with or without milk, to the entire exclusion of solid matters, whether animal or vegetable. The *chronic* form requires a close attention to the time and mode of taking food, the quantity and quality of the food itself, and the state of other parts of the alimentary canal, especially the large intestines, as well as that of the liver. Complete mastication, a moderate quantity of liquid and of solid food, a sparing use of condiments, and moderate intervals between meals, are points always to be insisted on. The diet suitable to each patient is, to a certain extent, a matter of experience, and distressing symptoms (such as palpitation with an irregular or intermitting pulse) have sometimes been removed by omitting some article, such as tea, from the diet-roll; or by substituting unfermented for fermented bread.

968. In organic diseases of the stomach, as in acute dyspepsia, abstinence from solid and irritating matters is indicated; but such substances must be prescribed as are nutritious, and yet unirritating; such as strong broths, soups, and jellies. When the stomach is unable to retain any food, life may be prolonged by nourishing enemata; by friction of the skin with oily matters; or by local baths of warm nutritious liquids.

969. There is a class of patients in whom much depends on the selection of food suitable to their age. This is especially the case in the diseases of children. Solid food of every kind is apt to disagree with very young children: it disorders the stomach and bowels, gives rise to infantile remittent fever, developes the scrofulous taint, and, if unchecked, terminates in hydrocephalus or mesenteric disease. Such children require a strict regulation of the diet, an abstinence from solid food, and, in extreme cases, a recurrence to the diet of the infant at the breast, substituting for the milk of the mother, asses' milk or new milk from the cow, and administering it, if necessary, in small quantities, and at long intervals. This simple treatment, aided by the steady use of aperients when required, is often attended with the best effects, after nourishing

and stimulating food, given with a view of imparting strength, has wholly failed.

970. These disorders of the stomach affect chiefly its *reducing* function. When its *converting* function is disturbed, the diet must be regulated in accordance with the existing disorder. In cases of diabetes mellitus, for instance, such a diet is prescribed as is least convertible into sugar. The saccharine staminal principles, therefore, are given in small quantity, and the diet is made to consist chiefly of albuminous and oleaginous elements. The substitution of gluten bread for common bread is also believed to be indicated in this disease. But these restrictions of the diet in diabetes are dictated by a theory of doubtful soundness, that when we cannot attack the cause or source of the disease, we ought to render difficult or impossible the development of its leading symptom. It is possible that a diabetic patient may thrive as well on a diet which supplies the elements of sugar, as on one that withholds them. To prescribe sugar itself is to push this theory to an unjustifiable limit.

971. A less strict attention to diet is necessary in the subjects of the oxalic diathesis, in whom it may suffice to forbid the use of crystallized sugar.

972. Strict dietetic rules have sometimes to be enforced as means of inducing certain states of the system. The strength and power of endurance developed during training for the ring, are partly due to the diet prescribed; and the reduction of weight in the jockey is effected in part by an opposite dietetic treatment. The results obtained by Mr. Banting, who reduced his weight in one year from 202 to 156 pounds by abstinence from bread, butter, milk, sugar, potatoes, and beer, afford a more complete illustration of the power of dietetic restrictions. In the practice of medicine diet plays an important part. Thus we allow a nourishing diet to the convalescent, and restrict a patient with a severe inflammatory or febrile attack to substances containing little or no nutriment; the *antiphlogistic* diet or regimen being more or less strict, according to the severity of the disease. In the most severe cases total abstinence from food may be necessary, liquids alone being allowed to allay thirst: in less severe cases, the patient may be restricted to a vegetable diet, as having little effect on the circulation.

973. During convalescence from acute diseases strict attention has to be paid to the powers of the stomach, as tested by the appetite, and to the state of the circulation, as evidenced by the pulse; and we pass with caution from the strict antiphlogistic regimen to vegetable diet, from that to fish or light broths, and then to meat in moderate quantity, beginning with mutton, as most easy of digestion.

974. In prescribing an appropriate diet, it should be borne in mind that vegetable food has little or no effect on the circulation, but that animal food acts as a stimulant; that warm liquids excite, while cold liquids act as sedatives; and that food affects the circulation most in the early part of the day. It is in cases of slow and unsteady con-

valescence, when there are some remains of local affection, when the appetite is variable, and that condition of the general system exists known as 'irritation,' that these facts must be applied in practice. When the patient, though weak, is free from disease, when the appetite is good, and the circulation tranquil, food may be given with less caution.

975. But there are cases in which a nourishing and even stimulating diet is necessary, though local inflammation and constitutional irritation be present, and the appetite for food is almost wanting. To this class belong exhausting discharges, and extensive injuries in course of reparation, for which we prescribe solid food of the stronger and more stimulating kind, with the nutritious and stimulant liquids, wine, ale, porter, &c. In such cases, too, the previous habits must be attended to, and the drunkard must be supplied with his accustomed stimulus.

976. As a general rule, where diet is equally efficacious with medicine, it should have the preference: for the duty of the physician is not to cure disease by physic, but by the most simple and efficacious means at his command.

977. Acute affections of the mucous membrane of the stomach may often be cured by diet alone. It is only occasionally necessary to apply leeches or blisters to the epigastrium. But for chronic dyspepsia both diet and medicines are required.

978. Many substances which increase the appetite and stimulate the stomach are in common use as *condiments*. Of these, common salt is the only one absolutely required; for experiment has shown that animals deprived of it soon perish, however nourishing their food in other respects; and one of the severest punishments to which man has ever been subjected, is a diet without salt. But when the diet consists principally of vegetables, spices are to be commended, as promoting digestion.

979. Almost every substance possessed of active properties increases the vascularity of the mucous membrane, and the flow of its secretion, and stimulates the muscular coat to contraction. The rubefacients, for instance, or substances which inflame the skin, inflame the mucous membrane of the stomach too; and many substances which cannot act on the skin through the cuticle, affect the more delicate and less protected lining of the stomach. In small doses these substances increase the appetite and strengthen digestion; but in large doses they act as emetics. Thus, common salt, which in moderation is the best and safest condiment we possess, in large doses produces sickness, and in still larger ones is an irritant poison.

980. Substances which act as emetics in large doses, are gentle stimulants in small ones; and from among these we select our condiments. Similarly acting substances are given as medicines in dyspepsia, or to qualify remedies directed to other organs. Thus, we combine mint, ginger, or cloves, with saline purgatives, ammoniacum with squills, galbanum with aloes, the essential oils with aperient pills.

981. The simple, the warm aromatic, or the astringent, bitters, under the names of aromatics, stomachics, carminatives, or cordials, are the remedies most frequently employed with a view of increasing the appetite, or causing the fibres of the stomach to contract. Ginger, mint, and cardamoms are among the best remedies of this class.

982. *Emetics.*—The remedies just enumerated, given in large doses, are emetics. Those in common use are ipecacuanha, tartar-emetic, and zinc; and mustard or common salt, on an emergency, when other emetics are not at hand. It is usual to promote the action of these substances by copious draughts of warm water, and by tickling the throat with a feather. Emetics are commonly prescribed merely with a view to unload the stomach; for this purpose they are often given at the outset of febrile affections. But they are also administered at intervals, with good effect, in incipient cases of phthisis pulmonalis, and in bronchitis accompanied with profuse expectoration. Emetics of common salt (three table-spoonfuls to a quart of water) have been prescribed with a view of producing reaction in the collapse of Asiatic cholera.

983. The stomach becomes less sensible to stimulants if often repeated: so that what was an emetic at first becomes a promoter of digestion; while a more gentle stimulant loses its effect entirely by repetition. Thus, a first cigar causes vomiting; but the habitual smoker finds that tobacco promotes digestion. The same thing occurs in disease. The first few doses of tartar-emetic often cause sickness; but the stomach becomes accustomed to its use, and, if continued, it produces an amount of stimulation favourable to digestion.

984. The remedies just mentioned, though differing little in their direct action on the stomach, vary greatly in their remote action on other organs, some belonging to the class of stimulants, others to that of tonics, and the most active being strong irritant poisons.

985. Both condiments and emetics cause a determination of blood to the mucous membrane; cold liquids and ice have the opposite effect, and are therefore to be commended in acute inflammation of the stomach, or active hæmorrhage from its surface. In chronic determination of blood, and in passive hæmorrhage, nitrate of potash in full doses may be administered with advantage.

986. Neuralgia of the stomach (gastrodyne) is often effectually removed by bismuth, zinc, and oxide or nitrate of silver, and troublesome sickness by creasote; as also by dilute hydrocyanic acid—a remedy of a different class.

987. *The Liver.*—The functional disorders of the *liver*, which consist in a diminished secretion of bile, are most effectually treated by small doses of mercury, or by nitro-muriatic acid, either taken by the mouth, or applied externally, as a foot-bath. Taraxacum and podophyllin are also given to increase the biliary secretion, for which purpose the remedy last named is extremely effective. Such remedies are termed *cholagogues.*

Intestinal Canal.—The chief functional disorders of the intestinal canal are diarrhœa, hæmorrhage, and constipation.

988. *Diarrhœa*, like dyspepsia, may be acute or chronic. Acute and recent diarrhœa, like acute gastritis, may always be removed by a farinaceous diet, from which all solid and irritating matters are excluded. It will also generally yield to a single full dose of castor oil. Chronic diarrhœa, from a congested state of the mucous membrane, may be cured most effectually by acting on the liver with small doses of the remedies just named (§ 987). If this treatment fails, which it may do in very relaxed conditions of the mucous membrane, astringents (chalk mixture, aromatic confection, catechu, kino, tannin, &c.) may be resorted to. When these fail, stronger mineral astringents, as sulphate of copper, combined with opium, may succeed, and nitrate of potash sometimes cures when these have failed.

989. Dysenteric diarrhœa, characterised not by profuse mucous discharges, but by scanty and teasing evacuations of a gelatinous substance, or of mucus mixed with blood, is best treated by full doses of castor-oil, with laudanum, following small doses of some mild mercurial preparation, or of podophyllin, given at night. Such action on the liver is especially indicated in chronic cases. The dysentery of warm climates, and of armies, is a disease which varies greatly in different cases, and in different epidemics, sometimes being highly inflammatory, and requiring antiphlogistic treatment, sometimes combined with scorbutic symptoms, and a degree of debility contra-indicating all active measures.

990. *Hæmorrhage* from the intestines (melæna) requires the same treatment as chronic diarrhœa—viz., small doses of mercurial preparations, or podophyllin, to act on the liver, and unload the vena portæ, and an unirritating diet.

991. Hæmorrhage from the bowels also occurs in dysentery; and in persons suffering from internal or external piles; and occasionally florid blood flows in large quantity from the open mouth of a single artery. Ipecacuanha and opium have been found eminently serviceable in dysentery. Piles are relieved by unloading the bowels, by promoting the secretion of the liver, by the local abstraction of blood, and the local application of warm or cold water, according to the experience of the patient. The arterial hæmorrhage is detected by the use of the speculum ani, and cured by the application of nitric acid to the bleeding vessel.

992. *Constipation*, as it arises from many causes, requires many remedies. The substances which naturally promote the action of the bowels are those innutritious matters that escape the action of the stomach; such as the cuticle and spiral vessels of vegetables, the hard covering of seeds, the tendons and gristle of meat. When these are carefully removed in the process of cookery, constipation is apt to arise, and may often be removed by restoring some of them to the food. Thus, brown bread often proves an effectual laxative. Constipation also occurs in persons of sedentary habits, and disappears under active exercise.

993. The medicines that cause vomiting when taken into the stomach, as tartar-emetic, tobacco, sulphate of zinc, ipecacuanha, squills, &c., and the whole class of irritant poisons, act as purgatives when they pass into the bowels; but many of the substances which act as violent purgatives have little or no effect on the stomach.

994. Purgatives act in two ways—by promoting the secretion of the mucous membrane, and by increasing the peristaltic action of the intestines; but some act slightly in one of these ways and energetically in the other. Those that excite abundant watery discharges are called *drastic* or *hydragogue cathartics*.

995. Medicines that act on the bowels may be divided into groups or classes. There are the *laxatives* (manna, cassia pulp, tamarinds, prunes, honey, bitartrate of potash, castor, almond, and olive oils); the *saline* or antiphlogistic aperients (sulphates of soda, potash, and magnesia); the milder acrid aperients (senna, rhubarb, and aloes); the strong acrid purgatives (as jalap, scammony, black hellebore, camboge, croton oil, colocynth, and elaterium); and, lastly, the hepatic purgatives (hydrargyrum c. cretâ, pilula hydrargyri, calomel, and podophyllin).

996. We choose one or other of these remedies, according to the object we have in view. If we wish simply to relieve the bowels, we prefer the compound rhubarb or colocynth pills, or combinations of aloes with rhubarb or ipecacuanha; if to promote the secretions of the whole course of the intestinal canal, we use the gentle laxative; if to reduce inflammation, the saline; if to overcome obstinate constipation, the stronger purgatives; if to remove dropsical effusions, the drastic or hydragogue cathartics; and if to promote the secretion of the liver, we combine the hepatic purgatives with those adapted to fulfil other indications.

997. The choice of purgatives is not more important, however, than the mode of administration. When the bowels have been long overloaded, and especially when the local irritation has affected the nervous centres, it is important to remove the load from the intestines without increasing the mischief already existing; in other words, hypercatharsis must be carefully avoided. Here we must not only select such purgatives as effectually remove the feculent matter, but watch their operation from day to day; and as soon as any signs of intestinal irritation make their appearance, we must withdraw our purgative, and treat the hypercatharsis by a farinaceous diet, as if it were ordinary diarrhœa.

998. In cases of extreme irritability of the stomach or bowels we may relieve the intestines by enemata, consisting of warm water, or gruel with or without an admixture of common salt; or we may employ, in the same way, any of the ordinary aperient remedies. We may also act on the bowels by rubbing into the skin of the abdomen croton oil combined with castor oil. The shock of cold water to the abdomen, sometimes employed with advantage in cases of obstinate constipation, or the electric spark, will also produce a purgative effect.

Enemata containing turpentine or an essential oil, such as the oil of rue, are often advantageous in the painful flatulent distension of the abdomen that occurs in many cases of fever as well as in other states of system. They are most effective when thrown into the bowels by the long elastic tube. Enemata of salt dissolved in gruel are also often administered for the removal and cure of worms, especially of the threadworm.

2. REMEDIES WHICH MODIFY THE COMPOSITION OF THE BLOOD.

999. All articles of food, and all poisons and medicines (even the least soluble), find their way into the blood. Those substances which enter naturally into its composition, when taken in quantities proportioned to the wants of the frame, are used in building up the fabric of the body; but when taken in excess, they undergo change and are eliminated by one or other of the excreting organs. Poisons and medicine, in like manner, mixing with the blood, circulate with it, and pass away gradually, and often slowly, in the excretions, so as to come in constant contact with the textures of the body.

1000. In the treatment of disordered states of system, and of diseases properly so called, we sometimes aim at a cure by administering such articles of diet or medicine as will supply some defective element of the blood; but sometimes we purposely introduce a substance foreign to its composition, in order to destroy or counteract some injurious or poisonous material to which the diseased condition owed its origin. The substances of the first order are termed *Restoratives;* those of the second order *Catalytics.*

1001. *Restoratives.*—The class may be distributed into two subclasses. (1.) This comprises water and every species of wholesome food, when the body is suffering from the want of them. Thus water has the virtue of a medicine after long marches, in starved and wounded persons, in some forms of poisoning, in profuse discharges of blood, and in diseases accompanied by excessive secretion; and there are cases in which a limited use of water may act beneficially. A nutritious animal and vegetable diet is as medicine to the convalescent; a spare diet, consisting chiefly of vegetables, to the plethoric and gouty patient. Fresh vegetables and ripe fruits are a *panacea* in scurvy; fatty and oily substances of some service in phthisis; animal and vegetable matters not containing sugar, and not easily converted into it, are preferred in diabetes mellitus; sugar in a crystallized form is forbidden in the oxalic acid diathesis, and fatty matters are contra-indicated in disease of the pancreas. (2.) This consists of those medicines, properly so called, which supply an element wanting to the blood. Such are iron and its preparations in anæmia and in allied states of system; such are alkalies and acids respectively, when from the acid or alkaline reaction of the urine we infer an excess of acid or of alkali in the blood. The whole class of vegetable tonic medicines, of which quinine is the most important, is believed by some authorities (see Headland on the Action of Medicines) to act favourably in states of debility by supplying to the blood an element closely allied in composition to the *taurin* of the bile.

1002. *Catalytics.*--The medicines of this class are believed to be able to destroy or neutralise certain morbid poisons existing in the blood. Mercury acts thus on the syphilitic poison, especially when recently introduced into the system; and iodide of potassium when it displays itself in secondary symptoms, and particularly when the periosteum is affected. Again, mercury, in an eminent degree, and the fixed alkalies in a less marked manner, possess the power of checking inflammation—a power attributed, at least in part, to their well-known property of rendering the fibrin of the blood more soluble. The nature of the change which arsenic produces in the blood is less obvious, though its efficacy is undoubted; and the same observation applies to iodine and antimony.

1003. The more active medicines which exert a control over inflammation also excite it when locally applied; and it admits of question whether this action is due to some change in the blood of the part, or in the state of its small vessels. The same difficulty presents itself when we try to explain the effect of these medicines taken by the mouth and thus introduced into the circulation. In the next section they will be treated as acting on the capillary vessels. In this place it must suffice to observe, that catalytic medicines have been distributed into no less than eight sub-classes, according as they have the power of counteracting inflammation, neutralising or destroying the poison of syphilis, promoting the absorption and dissipation of scrofulous deposits, correcting the state of the fluids in gout and acute rheumatism, curing scurvy, curing ague and other intermittent disorders, curing convulsive maladies, and proving more or less beneficial in diseases of the skin. (See Headland on the Action of Medicines.)

3. MEDICINES WHICH ACT ON THE ORGANS OF CIRCULATION.

1004. We recognise four distinct states of circulation in healthy persons, in disease, and under the operation of medicines, of which states the character of the pulse affords the best indication. 1. Increased frequency of pulse with increased force and fulness; 2. Increased frequency with diminished force and fulness; 3. Diminished frequency with increased force and fulness; 4. Diminished frequency with diminished force and fulness.

1005. In health, the first state of circulation is brought about by violent exercise, by spirituous liquors, and by other stimulants; the second, by those strong mental emotions and impressions which, in excess, give rise to syncope; the third attends exhaustion and sleep; and the fourth is commonly observed in the less healthy inhabitants of large towns, and in those who lead sedentary lives.

1006. In disease, the first state is present in acute inflammation or high inflammatory fever; the second, in diseases attended with extreme debility; the third, in some cases of hysteria, and in some cases and certain stages of apoplexy; and the fourth, in persons predisposed to, but not actually suffering from, pulmonary consumption, as well as in those who are recovering from fever, diphtheria, and other exhausting maladies, and exceptionally in some epidemics of fever and of the febrile exanthemata.

1007. The same conditions follow the operation of remedies; the frequent, full, and strong pulse is produced by spirituous liquors, by ammonia, and by other diffusible stimulants; the frequent, small, and weak pulse by tartar-emetic, tobacco, lobelia inflata, and aconite; and the infrequent pulse, of varying size and force, by opium, digitalis, conium, stramonium, and other allied remedies.

1008. In the cases specified—that is to say, in health, in disease, and under the operation of remedies—supposing the several states to be produced in the same person, with the same quantity of circulating fluid in his body, it is obvious that in a given time more blood will traverse each organ in the first case; less in the second; a variable quantity, sometimes more, sometimes less, in the third; and a smaller quantity in the fourth case.

1009. In the first case, the quantity of blood traversing each organ is increased in two ways; by the greater frequency of the heart's beat, and the larger quantity of blood sent out at each beat; in the second case, the blood traversing each organ is diminished, because the quantity sent out from the heart is lessened more than the number of beats is increased; and in the third and fourth cases, the heart sends out in the one more, in the other less, blood than will compensate the diminished number of its beats.

1010. The remedies which augment the frequency as well as the force of the heart's contractions are called *stimulants;* those which augment their frequency and diminish their force are called *depressants;* those which produce diminished frequency with increased or diminished force are termed respectively *narcotics* and *sedatives.*

1011. *Stimulants* (*incitants* or *excitants*).—The state of the circulation, as indicated by the pulse, being made the test and measure of the effect of remedies, those are stimulants which increase the frequency and force of the heart's contractions. In exceptional cases, however, stimulants lessen, in lieu of increasing, the number.

1012. This excited state of circulation is brought about by the agency of the nervous system, whatever the part to which the stimulant is applied; the change in the nervous centres being reflected back on the heart and organs of circulation. If, for instance, such a stimulant as brandy be taken into the stomach, the impression on its nerves is conveyed direct to the heart through the branches of the solar plexus, or to the brain and spinal cord, whence it is reflected upon the heart; or being absorbed into the circulation, it may be applied directly to the nervous centres, or to the nerves supplying the lining membrane of the heart itself. Here there are many possible ways in which the circulation may be affected; but a more simple case is that of exercise, the most powerful stimulant of the healthy frame. Its effect on the circulation is partly mechanical, but it also arises, in part, from the reflection of nervous influence on the heart in common with the voluntary muscles. Again, the effect of heat applied to the skin, though partly due to determination of blood to the surface, depends in some degree on the excited state of the nervous system.

1013. The local effects of stimulants on the healthy body are due to the increased flow of blood to all its organs. The rapid and abundant circulation through the lungs leads to a more frequent respiration, and a more complete decarbonization of the blood: the increased flow of arterial blood to the brain excites all its functions; the impressions on the senses are more acute, the flow of ideas more rapid, volition stronger and more prompt, the passions excited, the feelings joyous: the capillary circulation is increased; and the glandular structures pour forth their secretions; the involuntary muscles, too, partake of the general excitement, and the functions of digestion and defæcation are performed with increased vigour.

1014. But stimulants in excess act as depressants or narcotics. Thus spirituous liquors, in large doses, give rise either to collapse or to narcotism; in other words, they occasion vomiting, extreme debility, a cold sweat, a frequent and small pulse; or symptoms of apoplexy, with oppression of all the functions, paralysis of the voluntary muscles, a slow, or a quick, full, bounding pulse. The first effect is commonly produced in persons unused to the action of the stimulant; the second, in those accustomed to it. Similar effects are produced by chloroform and the æthers; but with them, narcotism is the rule and collapse the exception. The action of ammonia is more purely stimulant than that of either alcohol or æther.

1015. It was stated (§ 1011) that increased frequency, fulness, and force of pulse is the test of the action of stimulants, but that there is one case in which the test fails. It is the case of debility, without local disease, characterised by a small and frequent pulse which loses frequency and gains force under the use of stimulants. It has also been stated (§ 445), that the effect of stimulants on the infrequent pulse of debility without local disease, is much less than that produced on the pulse in health,—a fact easily explained by the nervous exhaustion that attends debility, and renders it dead to all impressions from within or from without. If stimulants administered in this state lower the pulse, they act favourably as tonics; if they raise it much, they do harm, imparting momentary strength, to be followed by proportional depression.

1016. As the question whether we shall or shall not administer stimulants in certain diseased conditions is a very important one, it may be well to describe the signs which indicate the expediency or necessity of resorting to them, as well as those which prove that we were justified in administering them. The conditions of systems which especially demand the exhibition of stimulants, are, 1. The fainting state. 2. The continuous exhaustion brought on by loss of blood, profuse discharges, prolonged abstinence, an innutritious diet, and mental or bodily fatigue. 3. The exhaustion which occurs when febrile disorders assume the typhous or adynamic type: and 4. The exhaustion that ushers in many severe diseases.

(1.) The fainting state, whether produced by sudden loss of blood, by violent or prolonged exertion, by exposure to a hot and impure atmosphere, by intense mental emotion, by the cessation of the heart's action in organic diseases of that organ, or by large doses of poisons, such as prussic acid, and the vapour of æther and chloroform, demands the same treatment; namely, the shock of cold water, and the diffusible stimulants, hartshorn, brandy, &c.

(2.) The exhaustion brought on by loss of blood, by continuous profuse discharges, or by any of the several causes just specified—a state indicated by extreme pallor of the face, skin, gums, and tongue; small, quick, and frequent, or small, frequent, and irregular pulse; hurried respiration, with frequent sighing; great nervous irritability; and, in some cases, delirium—demands the continued and persevering use of those less diffusible stimulants which combine alcohol in variable proportion with a certain quantity of nourishment, such as porter, ale, wine, and brandy. The quantity, strength, and repetition of the stimulant must be proportioned to the degree of exhaustion. It is generally expedient to combine a narcotic with the stimulant, and laudanum is the one obviously indicated.

(3.) The exhaustion which attends the typhous or adynamic type of fevers and inflammations also requires the use of stimulants. In the extreme degree of this state, marked by the position on the back, the sinking of the body towards the foot of the bed, the picking of the bedclothes, the low muttering delirium, and the involuntary discharges, such remedies are obviously necessary. But long anterior to this stage of extreme exhaustion and collapse stimulants may be given with the greatest advantage, though some of the symptoms may be such as to excite a doubt of the propriety of administering them: the skin may be hot and dry, the tongue coated with a dry fur, the breathing quickened, the pulse frequent and sharp with some fulness, the countenance dusky, the vessels of the eye injected with dark blood, the patient restless and delirious, his movements indicating considerable muscular strength. In this state of things it may become a grave practical question whether stimulants ought or ought not to be given, and our doubts can only be decided by actual experiment, and careful observation of the patient before and after the use of the stimulant. The best mode of procedure is first to examine and count the pulse; then, having caused the patient to swallow a glass of wine, to examine and count it afresh. If it become more frequent, and increase in hardness and sharpness, the stimulus is unsuitable; but if it fall and become decidedly slower and softer, we were justified in the use of the stimulant, and may repeat it. If, after an interval of a few hours, during which we have persevered in the use of stimulants, we find the pulse less frequent, slower, and softer, the tongue becoming moist, the skin cooler and moistened with perspiration, the breathing deeper and slower, the countenance less dusky, the eye more clear, and the restlessness and delirium abated, we have every reason to persevere in this course of treatment. A sign much insisted on by Dr. Stokes, as decisive of the necessity for stimulants, is the state of the heart. As it partakes of the weakness which affects the entire muscular system, its pulsations become extremely feeble, and the first sound almost imperceptible. The beneficial operation of stimulants is therefore indicated by a stronger impulse, and renewed distinctness of sound. As the one condition indicates the necessity for stimuli, so does the other justify their use.

(4.) The exhaustion which commonly supervenes in the advanced stages of continued fever, and in other diseases which have put on the typhous type, is sometimes present in the early stages of the same maladies. The first effect of the poison of the several infectious and contagious disorders is sometimes nearly allied to collapse. The patient is extremely weak, and faints on the slightest exertion, the countenance is pale, the surface cold, the pulse frequent, full, quick, and extremely compressible, and the respiration hurried. In this state also it may be a question whether stimulants ought to be employed, and actual experiment alone can decide the question. If the stimulant lowers the pulse and renders the breathing less frequent, we are justified in prescribing its repetition, taking care, at the same time, to be on the watch for the reaction which in most cases follows this state of depression.

1017. *Tonics.*—These remedies, as the name implies, are given in states of debility, and specially in convalescence from exhausting maladies, with a view of restoring firmness, strength, and *tone* to the entire frame. In extreme weakness, stimulants impart real strength; in other words, they become tonics. In less degrees of debility, they produce less obvious effect than on the robust and healthy. Again, stimulants in large doses become tonics in small ones. But the class of remedies to which the term *tonics* is commonly and properly applied gradually restore the strength without stimulating the system. One class of tonics, the preparations of iron, owes its virtues to its power of supplying a deficient element of the blood. The good effects of other tonics (such as bark, and its active principle quina) are not so readily explained.

1018. *Depressants.*—This name distinguishes a class of remedies which render the pulse frequent, small, and weak, being the exact reverse of the action of stimulants. This change in the circulation is accompanied by great prostration of strength, nausea, cold sweats, and all those symptoms which characterise approaching syncope; and it is brought about by the abstraction of blood, by the preparations of antimony, by tobacco, aconite, and the lobelia inflata, and by the less active remedies, ipecacuanha and squills.

1019. The loss of a large quantity of blood, or the rapid removal of a smaller quantity, occasions syncope, or a state approaching it; and as during this state the heart sends out a comparatively small quantity of blood, and propels it with little force, that part of inflammation which is due to increased action of the heart is removed by blood-letting.

1020. Tartar-emetic, which, next to bleeding, is our sheet-anchor in *acute* inflammation, and is the only depressant of acknowledged power and efficacy which acts simply as a depressant, brings about the same state as is produced by bleeding, and may be employed either alone or in combination with it in the treatment of all *acute* inflammations.

1021. As there is an exception to the rule that stimulants increase the number and force of the pulse, so is there an exception to the rule that depressants increase its number while they lessen its force. Thus blood-letting, which belongs to the order of depressants, renders the pulse full and strong, and even increases its frequency, in certain cases of plethora, when the circulation is oppressed, and in pneumonia, when the pulmonary circulation is impeded. Again, in cases of acute inflammation with high inflammatory fever, bleeding or tartar-emetic will lessen the frequency and force of the pulse at the same time. In all these cases, the *modus operandi* is the same; it appears to be different only because the circumstances vary.

1022. *Sedatives.*—These remedies differ from stimulants and depressants, inasmuch as, in lieu of increasing the frequency of the pulse, they diminish it. The true sedatives differ from the pure narcotics inasmuch as in large doses they cause delirium, while the narcotics in large doses occasion coma and apoplexy. Sleep, also, is an occasional, not a constant, effect of sedatives.

1023. Hydrocyanic acid, digitalis, and aconite, the principal remedies of this class, commonly lower the pulse. But there are states of system in which these remedies increase its frequency, just as there are states in which the effect of stimulants and depressants on the circulation is reversed. Digitalis, for example, which, in diseases accompanied by a frequent pulse, lowers it in a remarkable degree, and often much below the healthy standard, in some healthy persons, and perhaps in all, has the reverse action.* The effects of hydrocyanic acid are more constant; but exceptions doubtless exist to the rule of its operation.

1024. *Cold* is a most powerful sedative. A moderate degree of cold applied to the surface acts as a stimulant; but when the skin is hot and dry it reduces the temperature, lowers the circulation, soothes the nervous system, and disposes to sleep. Applied to the head, in the form of cold lotion or of ice, it is a most valuable remedy in inflammatory affections of the brain; and it is of the greatest service in all inflammations and hæmorrhages. Ice may be swallowed with advantage in bad cases of quinsey and scarlatina, and in hydrophobia with great relief to the symptoms. Applied locally, in the form of *douche*, it restores the contractility of the capillary vessels, and by preventing further effusion, allows the absorbents to remove any fluid that may have been thrown out. Intense cold is also a valuable anæsthetic, and has been lately employed by Dr. Richardson (as æther spray) in painful operations on superficial parts.

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* See the experiments of Dr. Saunders on his own person, detailed in his work on Consumption.

It also acts as a narcotic, and may produce states of system difficult to distinguish from the effects of alcohol.

1025. *Narcotics.*—The action of these remedies belongs so completely to the fourth head (the action of remedies on the nervous system) that nothing need be said in this place except that their effect on the circulation is the opposite of that produced by stimulants and depressants. They lessen the frequency of the heart's contractions. They also affect the respirations in a striking manner, diminishing their number in a still greater degree than that of the pulse.

1026. The remedies which have just been examined affect the circulation primarily by their influence on the nervous centres; and secondarily, through the reflection of that influence on the heart. It remains to speak of the remedies which affect the smaller vessels.

1027. *Remedies which affect the Small Vessels:* Treatment of inflammation.—It has been already stated that in inflammation there is diminished action (that is, diminished contractility) of the small arteries, with increased action of the heart, and that the two together keep up that dilated state of the small vessels which is the essence of inflammation. It is obvious that there are two ways in which these minute vessels may be restored to their healthy state: the first is by lessening the quantity of blood passing through them; the second, by increasing their contractility. In most acute inflammations, both changes have to be brought about. If the inflammation be recent, the small vessels may recover themselves on being relieved from the undue quantity of blood sent to them by the heart; and in this case the abstraction of blood, or the use of depressing remedies, will suffice. But if the inflammation be chronic, the small vessels may not recover their contractility, though the blood circulates through them in diminished quantity; and in this case we must use such remedies as restore the lost contractility of the vessels. The same treatment is required in the analogous state of congestion.

1028. The treatment of inflammation then is twofold—it consists in lessening the quantity of blood sent out by the heart on the one hand, and in restoring the lost contractility of the small vessels on the other. The first indication can be fulfilled only by general remedies, the second by general or by local means.

1029. As the increased action of the heart occurs only in the *acute* form of inflammation, it is in that form alone that general remedies are necessary. These remedies are blood-letting, aided, in certain cases, by active purgatives; and depressants, of which the best is tartar-emetic. An acute case of pleurisy occurring in a robust man, or in one previously enjoying good health, would be appropriately treated by bleeding to the approach of fainting, or the complete cessation of pain, followed at once by tartar-emetic, in such doses and at such intervals as to keep up a constant state of nausea. Bleeding alone, even though often repeated, would not subdue the inflammation, for it is followed by reaction, and that reaction re-establishes the inflammation. By combining depletion with depressing remedies we save blood, and avert chronic disease.

1030. But it should be understood that the prompt and decisive treatment of acute inflammation in healthy persons does not admit of extension to the so-called inflammations of the unhealthy inhabitants of large towns, in whom it may be necessary not merely to abstain from depletion, and the use of depressing remedies, but even to adopt an opposite mode of treatment.

There is also one disease of common occurrence, and fatal tendency, to which, for obvious reasons, the active treatment of inflammation is in most cases inapplicable. That disease is pneumonia, which is, in part, an inflammation affecting the vessels supplying the texture of the lung, and in part a congestion of the vessels conveying the blood to and from the lung for oxidation. The active measures which would subdue inflammation in the tissues of the lung, would, by reducing the force of the heart's beat, rather increase than diminish the congestion of the pulmonary vessels. In this disease, therefore, a purely expectant treatment, or, in the case of the inhabitants of large cities, a stimulant plan, has been shown to produce the best results.

1031. The strong action of the heart which attends acute inflammation is absent in inflammation of the mucous membranes, unless it takes on the most acute character, as in croup, or in cases of irritant poisoning. It is absent also in erysipelas, and in many inflammations attacking persons of broken constitution. The chief inflammatory diseases which affect the general circulation are those of the serous membranes and acute rheumatism.

1032. When inflammation of the mucous membranes is very severe, especially if the affected membrane line some narrow passage apt to be filled with the secretion poured out from its surface, depletion is necessary. Thus we bleed in croup, partly on account of the severity of the inflammation, and partly because the narrow passages of the larynx and trachea are apt to be filled up by tenacious secretion.

1033. When the seat of inflammation is an organ of extreme delicacy, we are obliged to employ general remedies, though the disease does not affect the circulation or threaten life. Thus, in inflammation of the internal parts of the eye, the most active measures are necessary to save the organ from destruction.

1034. As a general rule, then, it may be stated, that blood-letting is required in inflammation attacking robust and plethoric persons, or when it is attended by increased action of the heart, or when some function essential to life is impeded, or some delicate organ threatened with destruction.

1035. The second indication—that of causing contraction of the small vessels—may be accomplished in various ways: *locally*, by pressure, cold, astringent applications, and the cautious use of substances which themselves cause inflammation, but act as stimulants when applied in small quantity, and for a short period; and *generally*, by remedies which experience has shown to possess that property.

1036. If the vessels are much distended, local depletion is indicated as a preparatory measure. When the small vessels have by this means been partially emptied, we may apply the remedies just mentioned according to the nature of the inflamed part. Pressure, properly applied, lends support to the vessels; cold acts on all the textures of the part, on its vessels as well as on its nerves; astringent applications cause all the textures to contract, at the same time that they gently irritate the vessels, and excite them to the performance of their proper function; while such irritants as nitrate of silver, and sulphate of zinc or copper, prove beneficial by their stimulating property.

1037. All these applications are used with advantage—pressure in chronic inflammation and ulceration of the extremities, and in swelled testicle; cold, in every form of external and internal inflammation, in the inflammatory sore throat of scarlatina maligna, in the inflammation of the fauces attending hydrophobia, in inflammatory diseases of the rectum and vagina; astringents, in common or specific inflammation of the mucous membranes; stimulants in inflammation of the skin, in irritable ulcers, and in inflammation of the mucous membranes.

1038. The general remedies which promote the contraction of the small vessels (that is to say, remedies which act through the system and not by local application), are the metals, especially tartar-emetic, mercury, and arsenic, iodine, and, in a less degree, the fixed alkalies, and their salts. There are also certain remedies which affect particular organs, as uva ursi, copaiba, cubebs, pepper, cantharides, and turpentine.

1039. The first class of remedies (tartar-emetic, mercury, arsenic, and iodine), when applied to the skin, excite inflammation, thus showing the power which they exercise over the small vessels. They may also be absorbed and circulated with the blood so as to be applied to these vessels in the most direct manner; thus exerting the same power of curing inflammation which nitrate of silver has when locally applied.

1040. The cases in which one of these remedies is more applicable than another are found out empirically. Tartar-emetic is to be preferred in common, mercury and iodine in specific, inflammation. Mercury is to be preferred in cases of great urgency (such as iritis and croup), when our object is not merely to subdue inflammation, but to suspend the specific disease of which it is a part.

1041. Uva ursi, copaiba, cubebs, and black pepper are employed with advantage in inflammation of the mucous membrane of the urinary passages. They act as direct stimulants through the urine, and when given in sufficient doses, cure gonorrhœa, even in its acute stage. Uva ursi is used chiefly in inflammation of the mucous membrane of the bladder; copaiba and cubebs in gonorrhœa (in which disease pepper has also been employed), and black pepper in hæmorrhoids. Copaiba has been prescribed with advantage in cases of bronchitis.

1042. *Hæmorrhage.*—Active hæmorrhage demands the same remedies as acute inflammation; and passive hæmorrhage those which are useful in some forms of chronic inflammation—viz., cold, the preparations of lead, and medicines which contain tannin.

1043. The treatment of *febrile affections* is governed by the same general principles as the treatment of inflammation. When free from the complication of local disease, and attended by a frequent, full, and hard pulse, depressing remedies, such as bleeding and tartar-emetic, separate or combined, are indicated: but in cases attended by great prostration, with a small and frequent pulse, tonics or stimulants, according to the degree of debility. Local disease must be treated by general or local remedies, according to the powers of the system, with the precaution that the patient's strength must be husbanded, in order that he may not be worn out before the disease has run its appointed course. The same remark applies to those febrile affections of which local inflammations form a constituent part, as measles, scarlatina, small-pox, and erysipelas.

1044. The process of *secretion* is one over which medicine exerts much power, directly and indirectly. The most important secretions are those of the lungs, skin, kidneys, and bowels. The aërial secretions of the lungs are not subjects of observation or measurement.

1045. The influence of remedies on the secretions will be best understood by selecting that of the skin as an example. When the skin is red, hot, and dry, we can excite perspiration by the application of cold; when it is pale, cold, and dry, by heat. In the one case, we diminish the size of the small vessels, and lessen the quantity of blood they contain; in the other, we increase both. In the same conditions of skin, and in the same states of system, we produce the same results by depressants and stimulants, so that, in the case of this secretion, we can produce the same effect by a local application and by an internal remedy. In both cases, the temperature favourable to sweating is intermediate between the two opposite conditions accompanied by the dry skin; and may be termed the "sweating point."

1046. This point is not fixed, but varies in different persons, not only with the temperature of the skin and the quantity of blood circulating through the vessels, but with the condition of the vessels themselves; so that in strong and robust persons it must be much higher than in those worn out by disease; while in extreme debility it is well known that cold sweats take place from mere relaxation of the vessels, when the temperature of the body is extremely low.

1047. The fact that increased secretion from the skin may be brought about by remedies which act on the general circulation, may be extended by analogy to other secretions also. Thus, blood-letting, practised in a case of inflammatory fever, will promote the flow of all the secretions, by relieving the congestion of the vessels, and so bringing the glands to what may be termed their secreting point.

1048. When, therefore, we wish to promote the secretions, and especially that from the skin, we strive to bring the circulation into that state in which secretion is possible. When the skin is hot and dry, we select a depressant, when cold, a stimulant, diaphoretic; and we select a stimulating diuretic in languid states of circulation, a depressing one when there is strong febrile action.

1049. It is not meant to assert that all remedies which promote secretion act only through the general circulation; for the strong analogy which may be drawn from the local action of remedies on the small vessels in inflammation must admit of application to other states of those vessels. Tartar-emetic, for instance, combines a stimulant local action with a depressing effect on the general circulation.

1050. There is, indeed, one case in which the action of remedies in promoting secretion appears to depend almost exclusively on their adaptation to the quality of the secretion itself. The urine, for instance, abounds in salts, and saline medicines are of great efficacy in promoting that secretion: the perspiration, too, contains salts, though in less quantity, and may, therefore, be increased by remedies of which salines form a part. Thus, Dover's powder may possibly derive part of its efficacy from the sulphate of potash which it contains.

1051. The remedies which promote the *absorption* of fluids thrown out into the cavities of the body, act for the most part through the general system. Of these the most powerful is blood-letting, which acts by diminishing the quantity of the circulating fluid, and when the cause of dropsy is inflammatory, by removing the inflammation. The other remedies in common use are employed with the same views. They are directed to the secreting organs, the bowels, kidneys, and skin. The increased secretion from these parts has the twofold effect of blood-letting—it lessens the quantity of the circulating fluid, and it subdues inflammation.

1052. When the patient is very weak, tonics or stimulants (for stimulants are tonics to the weak) may have to be combined with depletion.

1053. The local means best adapted to promote absorption, are those which act as stimulants to the parts affected, such as friction with the hand, or with stimulating liniments, tincture of iodine, a jet of cold water, or electricity. These agents act favourably either by restoring the capillaries to their healthy state, or by stimulating the absorbents. (See § 341.)

4. REMEDIES ADAPTED TO THE REMOVAL OF THE SOLID STRUCTURES OF THE BODY.

1054. Morbid growths have been divided (see § 381) into *analogous* and *heterologous*. Experience shows that we have little or no power over the latter class; they form one of the *opprobria* of medicine, and where they cannot be removed by the knife, we can do little more than alleviate the sufferings they occasion. Analogous formations which do not consist in mere hypertrophy of a natural texture, are also little amenable to treatment.

1055. Atrophy and hypertrophy, indeed, seem to be the only alterations of the solid structures which are under the control of medicine. The remedies applicable to a state of atrophy are, exercise, friction, electricity, and, in short, all those means which increase the flow of blood to the part and promote its natural actions. Those, on the other hand, which are of use in hypertrophy are, rest, pressure, cold, local abstraction of blood, and preparations of mercury and iodine.

5. REMEDIES WHICH ACT ON THE NERVOUS SYSTEM.

1056. As all the functions of the body are more or less dependent on nervous influence, all active remedies must affect the nervous system. Stimulants, depressants, sedatives, narcotics, and some medicines, at least, which belong to the class of tonics, affect the circulation through the nerves; and even those remedies of which the action is strictly local act locally on the nerves, and, through them, on the vessels to which they are distributed. But there are some substances which exert so peculiar an influence on the nervous system as to demand a separate notice. In this action we recognise three marked varieties. Some produce a state of excitement in all the functions of the nervous system; others soothe the nerves, tranquillise the mind, and procure sleep; while a third class act chiefly on the organs of circulation and respiration, while they derange the functions of the brain, and occasion delirium. The first class are known as *stimulants*, the second as *narcotics*, the third as *sedatives*.

1057. (1.) *Stimulants.*—The mode in which these remedies affect the body, and the cases in which they may be used with advantage, have already been pointed out (§ 1011). But they not only affect the circulation in the manner described, but also all the functions of the brain, spinal cord, and nerves. The most active and efficient stimulants are ammonia, and its carbonate, phosphorus, musk, mustard, and turpentine; to which may be added the more active and diffusible among the narcotic medicines, alcohol, æther and chloroform, and camphor, the first effect of which is to stimulate the system. To these may be added, as special stimulants to the spinal cord and nerves of voluntary motion, the alkaloids strychnia and brucia, and the plants that contain them.

1058. (2.) *Narcotics.*—The *narcotics*, of which opium, and its alkaloid, morphia, are the chief, and lactucarium, the hop, and the nutmeg, the less important, are used to relieve pain (*anodynes*); to soothe irritation (*paregorics*); to diminish inordinate muscular contraction (*antispasmodics*); or, lastly, to procure sleep (*hypnotics*, or *soporifics*). Opium is both stimulant and narcotic; hence it is admirably adapted to the state of irritation accompanied by much debility, the narcotic principle soothing the excitement, the stimulant counteracting the debility. Sulphuretted hydrogen, carbonic acid, carbonic oxide, and cyanogen gas, act also as narcotics. As such carbonic acid gas has been locally applied.

1059. The remedies which occasion sleep or stupor as their leading symptom are sometimes grouped under the one head of narcotics, which is then subdivided into the smaller groups of *inebriants*, *soporifics*, and *deliriants*. The first group (inebriants) comprises alcohol and alcoholic liquors, chloroform and the æthers, camphor, and the Indian hemp, to which are sometimes added tobacco and lobelia inflata. All these remedies produce the phenomena of intoxication; but while the first-named act first as stimulants, the last two, tobacco and lobelia, have the opposite effect of depressants. The second group (soporifics) contains only one medicine of importance, opium; lettuce, hops, and nutmeg being of inferior value, and therefore rarely used. The third group (deliriants) comprises hyoscyamus, belladonna, and stramonium; which, it is scarcely necessary to observe, are not given in the practice of medicine in such doses as to cause delirium. As medicines they rank with sedatives. Of these three groups the first and second are the most important; the first as containing the invaluable *anæsthetic* chloroform; the second, the no less valuable drug, opium.

1060. (3.) *Sedatives.*—This class comprises many substances allied in some of their properties to the narcotics, and in others to the depressants. They differ from the narcotics in not producing sleep, but, on the contrary, delirium. Thus, hyoscyamus, belladonna, stramonium, monkshood, black hellebore, veratria, colchicum, and camphor, to which, perhaps, musk and valerian may be added, give rise to delirium in the first instance, sometimes followed, after a considerable interval, by coma. Tobacco, ipecacuanha, conium, squills, and digitalis, appear to produce coma without previous delirium. Tobacco, ipecacuanha, and squills, and the lobelia inflata, have been already described as depressants, and have been shown to have a remarkable effect on the muscular system. Tea and coffee belong to the class of sedatives. But this class contains no more important member than cold.

1061. Cold has already been mentioned more than once, when speaking of the effect of medicines on the circulation, as a remedy of great power (§ 1024). But cold may produce a marked sedative effect on the nervous system, without any corresponding effect on the circulating organs. It blunts sensibility and subdues pain, and in cases of violent nervous excitement it allays the irritation of the nervous system, reduces the number of the pulse, subdues the most violent pain, and infallibly procures sleep. It is also of great efficacy in the most violent paroxysms of mania.

Having indicated the chief remedies which affect the nervous system, it will be useful to speak more particularly of their action on the special functions of sensation and voluntary motion.

1062. The remedies which act on the *nerves of sensation* are classed by the toxicologist with narcotic or narcotico-acrid substances; but in works on Materia Medica they are considered as sedatives. Of these aconite is the most powerful. It produces numbness, and a tingling sensation in the parts to which it is applied. Strong hydrocyanic acid, locally applied, also causes numbness; opium and belladonna, too, act locally on the nerves of sensation; and chloroform acts as a powerful local anæsthetic, after producing, as its first effect, redness and heat of surface. But the best sedative is cold. It is sure and manageable, and, with proper precautions, may be applied whenever a sedative is indicated.

1063. Belladonna shares with hyoscyamus and stramonium the power of dilating the pupil through its action on the retina, whether given internally or applied directly to or near the eye. The Calabar bean has the opposite effect.

1064. The *nerves of voluntary motion*, and through them the muscular system, are powerfully affected by remedies in three different ways —with *paralysis*, *convulsions*, and *tonic spasms*.

1065. Extreme muscular debility is the familiar effect of all depressing remedies, and especially of tobacco. The same effect is produced by tartar-emetic among mineral, and tobacco and lobelia inflata among vegetable, poisons. Paralysis, or the extreme of muscular weakness, is produced by various poisons, as the woorara, ticunas, and curare, and by large doses of aconite and conium, and by one metallic poison—lead.

1066. Convulsions are produced by almost all active poisons. They precede the fatal event in quick poisoning by hydrocyanic acid. They occasionally occur in poisoning by opium, arsenic, and the more active mineral poisons.

1067. Tetanic spasms are produced by nux vomica, by St. Ignatius bean, by the upas tieuté, and by the active principles strychnia and brucia. They are an occasional effect of monkshood, and of the ergot of rye taken in poisonous doses, and they are sometimes present in poisoning by the more active irritants.

1068. The muscular contractions of the uterus caused by the secale cornutum furnish an example of local action on the muscular fibres, of which advantage is taken in the practice of midwifery.

1069. The treatment of diseases dependent on, or accompanied by, local affections, with reflex action of the muscles, is of much importance, especially in such diseases as tetanus and hydrophobia. In the latter disease ice has been swallowed with great relief to the symptoms.

1070. Many of the metallic substances used in medicine, such as the salts of arsenic, copper, iron, silver, and zinc, appear to exert a peculiar influence on the nervous system. They act locally as irritants, and when administered in small doses, and during a considerable period, as tonics; as such, they have been used with advantage in chorea and epilepsy.

6. NURSING.

1071. In nursing, attention must be given to the following particulars:—Situation of the sick-room; the room itself—its arrangements, temperature, ventilation, light, refreshment; administration of medicine and food; general condition and personal comfort of the patient; his intercourse with his attendants; precautions to be used in cases of contagious disease.

1072. *Situation of the Sick Room.*—When we can exercise a choice, a south, south-west, or west aspect should be preferred. In acute inflammation of the brain or eye a north aspect is best.

The room should be spacious, lofty, lightsome, and furnished with a chimney having a good draught. In some cases the carpet may be retained, but all superfluous furniture, hangings, and articles of clothing should be removed.

1073. *The patient's bed* should be placed with its head out of direct currents of air from the door and windows, and with ready access to either side of it. It should be furnished with rollers that it may be wheeled to any part of the room. As a rule it should be without curtains. A calico screen may be used to intercept draughts, or the view of the door, and of the part of the room used by the nurse in preparing food or medicine.

1074. *Temperature.*—This may range from 60° to 70° Fahr., according to the feelings of the patient, and should be kept as constant as possible. If the patient complain of cold, a hot water bottle, or cushion, or an additional blanket may be used.

1075. *Ventilation.*—In cold and moderately warm weather a fire should be kept constantly burning. If the external air be very cold, the fresh air may be derived through the door from the lower parts of the house; if temperate, the landing window and the bedroom door, or one of the bedroom windows, should be opened. In summer, when it is too warm to have a fire, the windows should be wide open during the day and at night be partially opened. The door may be kept ajar and occasionally fanned to and fro to cause a freer circulation of air. Vitiation of the atmosphere of the sick-room by many visitors and too many attendants must be avoided. The combustion of gas, too, must be prohibited. Growing plants may be freely introduced into the sick-room, as they serve both to purify and to moisten its atmosphere.

1076. *Light* should be moderated according to the feelings of the patient. If he be watchful it should occasionally be excluded during the day, advantage being taken of the times when the vigilance is least. It must be constantly excluded in cases of active inflammation of the brain or eye. Direct sunlight is rarely tolerated in acute disease, but in some chronic diseases it is both pleasing and refreshing.

1077. *Refreshment.*—Offensive odours diffused through the air may be counteracted by burning incense or a pastille, sprinkling eau de Cologne, or burning coarse brown paper saturated with a strong solution of nitrate of potash, dried, and kept for use. But for their more effectual removal the carpet should be taken up, the floor sprinkled several times a day with solution of chloride of lime; or rags wetted with Condy's fluid (solution of permanganate of potash) should be suspended near the bed. In cases of infectious disease, such as fever, diphtheria, gangrene of the lungs, &c., baskets of wood charcoal should be placed under the bed and in the corners of the room, and the evacuations should be received into a solution of chloride of lime, zinc, sulphate of iron, or permanganate of potash ; or into a mixture of dry earth, ashes, or powdered wood charcoal, with sulphate of iron (℔j to ℥i).

1078. *Administration of Medicine.*—Pungent medicines should be given well diluted with water, to obviate coughing and nausea. Doses should be carefully measured in a medicine-glass, and given without delay, especially when they contain volatile ingredients. Deposits, if any, should be well shaken up. In the intervals the bottle should be kept closely corked. As a rule, medicine should be given an hour before food. But if nutriment has to be administered frequently, the medicine must be so given as least to interfere with it ; stimulants may be taken with stimulants, and tonics with food ; purgatives should be given before food ; hypnotics at any time.

1079. *Administration of Food.*—If a patient has a distaste for food, very small quantities should be offered at a time. He may thus be induced to partake of it again and again when a larger quantity presented at once would be rejected. In irritable conditions of the stomach a tablespoonful of nourishment may excite vomiting, while a teaspoonful repeated often would be retained. Strong tea and jelly may be both suitable and harmless, but together, we must remember, they form indigestible leather. Orange and grape juice is generally harmless, but few things are more indigestible than the pulp, skins, and seeds of these fruits. In the typhous condition food or stimulants are needed every hour ; and as the patient is well-nigh insensible to his wants, his life depends on the close attention of the nurse.

1080. *The nurse* should be quiet, circumspect, and firm, and possess the tact only to be acquired by experience. Good eye-sight is indispensable. She should set aside out of reach sedative draughts, liniments, and other external applications, keeping within easy reach only such mixtures or draughts as are required at short intervals. She should be provided with oiled silk, oiled cloth, &c., so as to prevent discomfort in the use of poultices and moist applications. She should be allowed as little discretion as possible ; written directions as to the nature and quantity of food and medicine, and the times of its administration, should be given to her, and she should be directed to make a written report accordingly, noting down the number of hours during which the patient has slept, the time at which any new symptom, such as pain, dyspnœa, vomiting, or fits, &c., occurred ; and whether, and when, the bowels or bladder have acted. She should be directed in certain cases—such as constipation, diarrhœa, enteric fever, dysentery, hepatic disease—to set aside the evacuations in the water-closet. In severe disease a bed-pan and glass urinal should be provided for the patient's use. The urine should be occasionally preserved for examination.

She should look to the general condition of the patient, and note the temperature of the body, and especially of the feet. In the typhous condition these parts may be found cold and purple, when it is too late to recover them from this incipient stage of gangrene. In spinal and cerebral diseases, as well as in the typhous condition, the integument over the sacrum and trochanters must be daily looked to; and it it appear congested, lead plasters spread upon amadou or wash-leather must be applied, and the pressure obviated by a water-pillow or water-bed. The medical attendant must occasionally verify the statements of the nurse, and himself examine the condition of the hypogastric region. When, in cold weather, a patient is placed on a water-bed, a thick non-conducting layer of folded blankets must be put between the bed and body. If cold be complained of, we must occasionally introduce hot water and draw off the cold.

1081. *Personal Comfort of the Patient.*—If the patient's condition allow of it his bed should be made every day, a couch being at hand to receive him. In cases of protracted illness two beds may be provided with advantage. The linen should be changed as often as it can be done without undue fatigue, and advantage should be taken of this change to administer a bath, or to sponge the surface with warm water. A bath is a very important adjunct to a sick room, for we have no more efficient means of provoking sweat and of soothing nervous excitability than the warm bath. In some cases (scarlatina, suppression of urine, convulsions) its use is indispensable. A thermometer should be at hand to regulate the temperature. For a tepid bath we may prescribe 85°; for a warm 95°; for a hot 105°.

If it can be done without fatigue, the teeth should be brushed, the mouth cleansed occasionally, and the hair brushed.

1082. *Thirst* may be allayed by toast-water, thin gruel, or barley-water, by soda-water, lemonade, or iced water slightly acidulated, if need be, with sulphuric or phosphoric acids, and sweetened. In the typhous condition spirit or wine may be added to these drinks.

1083. *General Management of the Sick-room.*—All should be quiet and yet cheerful here. If the patient be unduly apprehensive, anxious looks and tones must be avoided in his presence. When he is awake to impressions, there should be no whisperings in his presence or hearing. In the sick-room all our communications should be *with* the patient, either directly or openly through the nurse. We must inspire confidence and hope by a plain, easy, and decided manner. There must be no mystery or ambiguity about our acts and words. We must answer the solicitous inquiries of the patient as simply and straightforwardly as possible, so as to leave no doubt in his mind. "You are better by this little indication." "You are worse because of this complication, against which I am going to direct remedies such as we may reasonably hope will cause it to yield sooner or later." "What you want is sleep, and this we will secure for you to-night." Such must be the language of the medical attendant.

1084. The sensations and ideas are so perverted in delirium that patients labouring under mental disease, whether primary or secondary, are best treated by assuming a cheerful indifference. When homicidal and suicidal tendencies exist, cutting instruments must be removed, and windows secured. If the patient obstinately refuse food, do not press it—put it from time to time before him, and let others eat in his presence. Loud, strange, or uncertain noises should be prevented. The influence of music may be brought to bear in certain cases.

1085. In protracted illness, when the intellect is clear, we should vary the position of the bed, and change from time to time the pictures, ornaments, and furniture of the room, and distribute about it Wardian cases, aquaria, growing plants, and cut flowers of various hue; for anxiety and gloom are inseparable companions of severe illness, and we should not neglect any means, however trifling, of dispelling them.

1086. When a case of contagious fever occurs in a house, and the patient cannot be removed, strict precautions are necessary to prevent the spread of the disease. The younger members of the family should be sent away at once, or, if this be impracticable, they should live and sleep on the ground-floor. The patient should be placed in the airiest and most secluded room in the highest part of the house, and only those in attendance should have access to that story. If possible, he should be under the care of a single nurse, and an adjoining room should be devoted to her use, with ready means of communication with the people below. Her food and that of the patient should be brought up to the landing on the floor below, where she should receive it. She should go down stairs as seldom, and keep aloof from other persons as much, as possible. Before leaving her room she should be careful to wash her hands. A fire and a large kettle of boiling water should be constantly at hand. A separate set of articles should be devoted to the patient's and the nurse's use, and before they are sent down stairs they should be placed in a vessel, and boiling water poured from the kettle upon them. Linen should be treated in the same way, and then wrung out and put aside. It should be allowed to accumulate to the end of the illness, and after a second exposure to the action of boiling water, be sent to the laundress. The patient's room must be thoroughly ventilated. Disinfectants should always be mixed with the dejections, and they should be conveyed to the water-closet in a tightly-covered vessel. The water-closet pan should be well flushed. If other conveniences be near, the rest of the household should use them during, and some time after, the illness.

1087. After convalescence the sick-room must be thoroughly cleansed. Clothes which cannot be washed must be burned. The bed, mattress, and carpets must be baked in a hot oven; oil paint scoured, the ceiling whitewashed, the walls re-papered, the floor scalded, and afterwards scrubbed. The door should be kept shut, and the windows open, and a large fire should be kept up during, and for some days after, the cleansing. Boiling water, is a thorough disinfectant. We may use such disinfectants as charcoal, chloride of lime, chloride of zinc (Burnett's fluid), permanganate of potash (Condy's fluid), and carbolic acid, in addition, but we must not trust to these alone.

PART II.

PRACTICE OF MEDICINE.

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GENERAL DISEASES.

CHAPTER I.

STATES OF THE SYSTEM.

PLETHORA	The Plethoric State.
ANÆMIA	The Anæmic State.
CACHEXIA	The Cachectic State.
MIMOSIS INQUIETA	The Nervous State.
FEBRICULA	The Febrile State.

THE subjects treated in this chapter have peculiarities which entitle them to a place by themselves. They are rather disordered states of system than diseases properly so called. They consist in a departure from health, more or less permanent, not necessarily complicated with any local affection, and often present and cognisable in combination with specific and well-defined maladies. A plethoric, an anæmic, or a cachectic patient, or one suffering from extreme debility, or from a group of nervous symptoms, may become the subject of one and the same disease, such as typhus fever or small-pox, which disease will be materially influenced in its character, progress, and termination by that pre-existent *state of system.* The treatment also which it may be proper to adopt, with a view to the cure or relief of the patient, will be materially influenced, and in some cases altogether determined, by the state of system on which the disease has supervened. Again, in all those diseases in which the symptoms are obscure, or the appropriate remedy not yet discovered, the only course open to the physician is to direct his prescriptions to the state of system. Nor ought it to be forgotten that these states of system may be themselves brought on by several analogous local or general causes, and that to recognise the state of system is to possess a clue to the often obscure, and little suspected, origin of the existing disorder. For these reasons the contents of this chapter are placed by themselves, and take precedence of diseases properly so called.

PLETHORA.—THE PLETHORIC STATE.

SYNONYMS.—General Hyperæmia.—Polyæmia.—Fulness of blood. —A full habit of body.

DEFINITION.—A state of system characterised by an excessive quantity of blood, or by an excess of its more solid constituents.

SYMPTOMS.—The general aspect of the body full and florid; the capillaries of the surface injected; the redness of the skin momentarily removed by pressure; the lips red; the eyes bright, and the conjunctiva injected; the tongue clean and red, or slightly furred; the appetite generally good; the bowels usually confined; the skin dry, but perspiring profusely on exertion; the pulse frequent, full, firm, and bounding. In the more strongly-marked cases, the pulse is infrequent, indistinct, and labouring, or irregular in force and frequency, according to the degree in which the heart is oppressed; the extremities are cold; the patient is weak, listless, and easily fatigued, and suffers from palpitation and shortness of breath, and frequent sighing on exertion; and complains of giddiness, noises in the ears, bright or dark spots before the eyes, and a dull heavy pain in the head.

TERMINATIONS.—In local congestions, inflammations, and hæmorrhages; in apoplexy, especially in persons with large chests and short necks; in hypertrophy of the heart; in gout.

PATHOLOGY.—This disorder consists in an excessive quantity of blood, or, the quantity remaining unchanged, in a superabundance of red particles and fibrine.

CAUSES.—*Predisposing:* A peculiar habit of body, with large chest and short neck. *Exciting:* A highly nutritious diet; beer and spirituous liquors; sedentary habits; too much sleep; inadequate exercise, with free exposure to the air; suppression of the catamenia.

DIAGNOSIS.—This state is easily recognised by the fulness of the whole capillary system, and the rapid filling of the vessels of the surface on the removal of pressure.

TREATMENT.—*Indication:* I. To lessen the quantity of blood. II. To increase the actions of the emunctory organs.

In the common run of cases, this indication is best fulfilled by a spare diet, abstinence from malt and spirituous liquors, early rising, regular exercise, and the frequent use of saline aperients. Forms. 260, 262.

In extreme cases, and where there is a threatening of local disease, bleeding from the arm should be practised in addition to the treatment just prescribed. As a general rule, small bleedings are to be preferred; but in some cases the system will bear the removal of forty ounces, or more. The blood should be taken from a small orifice, in the semi-erect or recumbent posture, and the pulse should be examined to ascertain the effect produced. When it is frequent, full, and bounding, blood may be drawn till it falls to its natural frequency and force; if labouring, till it becomes full and free; if irregular, till it becomes regular. But, as a general rule, it is better to avoid the letting of blood, and to trust to the prolonged use of abstinence, exercise, early rising, and saline aperients. If amenorrhœa be present, four or six leeches may be applied to the groin at the menstrual periods. If apoplexy or gout impend, the treatment must be modified accordingly.

PROPHYLAXIS.—To prevent the rapid formation of blood, the diet should be plain and somewhat restricted, with total abstinence from malt or spirituous liquors; perspiration must be promoted by brisk exercise, and the bowels kept free by suitable aperients.

ANÆMIA—THE ANÆMIC STATE.

DEFINITION.—A state of system characterised by a diminution in the quantity of the blood, or of the red particles and other solid ingredients.

VARIETIES.—1. Anæmia from loss of blood. 2. Chronic anæmia. 3. Cachectic anæmia, or chlorosis.

1. ANÆMIA FROM LOSS OF BLOOD.

SYMPTOMS.—The most familiar of the effects of loss of blood (or of profuse discharges rapidly poured out) is *syncope*, of which the symptoms are giddiness, followed by loss of consciousness; suspension of respiration alternating with deep sighs; the pulse and beat of the heart scarcely, if at all, perceptible; the surface pale, and bedewed with cold perspiration. Recovery takes place with momentary delirium, yawning, deep sighs, sickness, and a gradual return of colour to the skin, and of pulse to the heart and wrist. This fainting state is followed by reaction, and recurs from time to time on slight exertion, or change of posture; but in *fatal cases* the symptoms become gradually and progressively worse; the countenance paler and more sunken; the extremities colder and colder; the breathing hurried and interrupted by deep sighs or yawns, panting, gasping, or stertorous; the pulse imperceptible; restlessness and jactitation are followed by coma, or convulsions; at length, the patient's strength is exhausted, and he sinks, gasps, and expires. Death is occasionally the consequence of suddenly assuming the sitting or standing posture.

The state of *reaction* is characterised by peculiar and strongly-marked symptoms: by forcibly beating of the carotids, with a sense of throbbing and tension in the head; palpitation of the heart, throbbing at the pit of the stomach, and in the course of the aorta, and a frequent, bounding, and often irregular sharp pulse; a hurried, panting, sighing, respiration; restlessness, jactitation, and mental agitation; intolerance of light and sound; the sleep disturbed by fearful dreams; the waking hurried and perplexed. Violent delirium, mania, coma, amaurosis, and deafness are among the concomitants of this state.

POST-MORTEM APPEARANCES.—An empty state of the cavities of the heart, and general pallor of the viscera, most marked in the lungs.

DIAGNOSIS.—The extreme pallor of the face, skin, lips, and gums indicate the diminution of the blood.

TREATMENT.—*Indications.* I. To stimulate the brain with the blood that still remains. II. To maintain the action of the heart by external and internal stimulants. III. To subdue abnormal nervous action. IV. To promote the formation of new blood.

The first indication is fulfilled by placing the head on a level with the chest; the second, by the free exhibition of ammonia, wine, or brandy, and the application of cloths wrung out of hot water, or of sinapisms to the region of the heart; the third, by a full dose of opium, such as ʒi. of the tincture, which, in an urgent case, is obviously preferable to the solid preparations of the drug. If violent delirium or acute mania be present, as a consequence of the loss of blood, we may repeat the soporific at intervals of three or four hours, according to the effect produced. Convulsions declare the most imminent danger, and if the means are at hand we should use transfusion of blood from the arm of another person. Galvanism and artificial respiration may be resorted to as a last means of restoration. The formation of new blood will be promoted by the introduction of thin gruel, beef-tea, or an emulsion of egg and milk into the stomach, or, if the power of deglutition fail, into the rectum. Having once re-established the circulation, the subsequent treatment will be that suited to chronic anæmia. For a time the erect or sitting posture must be strictly interdicted.

2. CHRONIC ANÆMIA.

DEFINITION.—A state of system coming on gradually, continuing generally for some weeks or months, and dependent on a decrease in the red particles and solid constituents of the blood.

SYMPTOMS.—Universal pallor of the skin, conjunctiva, gums, and membrane of the mouth; dead whiteness of the tongue; cold extremities; debility; fainting fits; palpitation and dyspnœa on the slightest exertion, with violent pulsation of the carotid arteries; headache, consisting generally in a fixed pain over the eyebrows or on the top of the head; pain under the left breast, or a sense of fulness in the chest; pulse frequent, small, and quick (in extreme cases aptly described as *jerking*), increased by exertion and emotion. The patient is easily agitated by slight noises or unexpected events, and suffers from depression of spirits, and, in some cases, from hysteric fits; the secretions and excretions are generally scanty, and the bowels often torpid.

PHYSICAL SIGNS.—On applying the stethoscope over the large veins of the neck in the supra-clavicular space, especially on the right side, a humming sound (*bruit de diable*—humming-top sound, or venous murmur) is heard. Slight pressure of the stethoscope upon the larger arteries produces a *bruit de soufflet*, sometimes resembling the soft sound caused by blowing across the mouth of a bottle; at others it is shorter and harsher, like the puffing of a locomotive engine. A soft blowing sound is frequently heard at the *base* of the heart. In the space above the clavicle the venous murmur and the arterial bellows sound are often heard at the same time. These are doubtless indications of a flaccid condition of the arterial and venous tubes. They are not peculiar to anæmia, nor are they required as diagnostic marks when the pallor of the surface is well marked.

COMPLICATIONS.—It is often, but not always, associated in the female with amenorrhœa, or with scanty menstruation.

CAUSES.—*Predisposing.* The female sex, and the age of puberty, or the period preceding or following it. It is rare in males. *Exciting.* In females obscure, but connected with the function of menstruation. In males occasioned by overwork; as with compositors, bakers, and others, who work much of their time in dark, hot, and ill-ventilated rooms. For other exciting causes of the allied state Cachexia, see Cachexia.

PROGNOSIS.—Favourable; but recovery sometimes slow and tedious.

DIAGNOSIS.—From chlorosis, by the absence of disorder in the functions of the alimentary canal. The soft basal bellows murmur must not be attributed to *organic* heart disease.

TREATMENT.—*Indication.* 1. To promote the formation of the red particles and solid constituents of the blood. This indication is fulfilled by the use of the preparations of iron in full doses, together with a nourishing diet. The best preparation of iron is the dried sulphate, of which five grains may be taken three times a day. If the bowels be torpid, the pilula aloes et myrrhæ may be given every night, or as often as may be required.

I have given the dried sulphate of iron, combined with extract of gentian, in ten-grain doses; and an anæmic female, who takes these pills as others take stimulants, swallowed on one occasion twelve pills, containing half a drachm of sulphate of iron, in one day. The same preparation, in the same liberal doses, may be given with like advantage in the few cases of anæmia that occur in the male subject. (G.)

A generous diet, with a moderate allowance of wine, is indicated in cases of anæmia accompanied by marked debility; and exercise in the fresh air, proportioned to the strength of the patient, should be insisted on. When the spirits of the patient are depressed, change of air and scene, and the use of chalybeate waters, may be recommended. The shower-bath, and sea-air with sea-bathing, may also be prescribed with advantage.

Mercurial preparations should be given with caution, as there is reason to believe that salivation is very readily brought on in anæmic patients.

3. CACHECTIC ANÆMIA, OR CHLOROSIS (GREEN SICKNESS).

DEFINITION.—A state of system partaking of the characters of anæmia and cachexia; and combining an altered state of the blood with a depraved state of the secretions.

SYMPTOMS.—A greenish-yellow pallor of the skin, puffiness, and often œdema of the integument; heaviness; listlessness; fatigue on the least exertion: palpitations; throbbing of the carotid arteries; shortness of breath; pains in the back, loins, and hips; indigestion, with flatulency and acidity in the stomach; offensive breath, and disordered bowels, with offensive evacuations. The appetite is often singularly depraved; lime, chalk, and other absorbents are sometimes greedily eaten, and the accustomed food rejected.

As the disease advances, the lips lose their colour; the eyes are encircled with a livid areola, the face becomes pale, and assumes a dusky yellowish hue; the feet are affected with œdematous swellings; there is every indication of want of power and energy. The breathing is hurried by the slightest exertion; and the pulse is small, quick, and frequent.

CAUSES.—Those of anæmia and cachexia combined. Amenorrhœa is a general, though not a constant, accompaniment.

TREATMENT.—*Indications.* I. To restore the normal character of the blood by the means recommended in the treatment of chronic anæmia. II. To correct the depraved secretions.

The second indication may be fulfilled by gentle aloetic aperients, combined with myrrh and a little blue pill.

The menstrual function, in most cases, need not be interfered with, but if any urgent uterine symptoms be present, they must be treated by the remedies pointed out under amenorrhœa, dysmenorrhœa, &c.

CACHEXIA—CACHEXY, BAD HABIT OF BODY.

DEFINITION.—An unhealthy state of system, allied to anæmia, and due to some poison gradually introduced into the body, or generated within it, circulating in the blood, and giving rise to important changes in its composition.

VARIETIES.—Syphilitic Cachexia. Alcoholic Cachexia. Marsh Cachexia. Tubercular Cachexia (Tuberculosis). Carcinomatous Cachexia. Cachexia of hot climates. Leucocythæmia. Supra-renal cachexia.

SYMPTOMS.—A sallow, dusky, or muddy complexion, often tinged with yellow; a dry and harsh skin; a small, frequent, and compressible pulse; the tongue sometimes clean, moist, and red, sometimes pale, but more commonly furred, or cracked; the appetite capricious, often craving and voracious; dyspeptic symptoms; the bowels either costive or loose, with dark, slimy, and offensive fæcal discharges; the urine generally high coloured, of a strong odour, and depositing amorphous lithates; the perspiration and breath offensive. Enlarged tonsils, aphthæ, and cutaneous eruptions, are frequent concomitants of this state, as are also obscure and wandering pains of the body and limbs.

TERMINATIONS.—In organic diseases of the internal viscera, especially the lungs, liver, and kidneys; these diseases being often complicated with ascites or anasarca.

CAUSES.—*Predisposing.* Debility in infancy, and hereditary defect of constitution. *Exciting.* Unwholesome diet; want of proper exercise; intemperance; continued exposure to marsh miasma, to a cold. damp atmosphere, or to unhealthy climates; the impure air of crowded cities; the gradual operation of mineral poisons, such as mercury, lead, copper, and arsenic; and of animal poisons, especially the syphilitic virus.

PROGNOSIS.—*Favourable,* if the patient can be removed from the influence of the ascertained cause, and in the absence of organic disease. *Unfavourable,* when complicated with severe visceral disease.

TREATMENT.—*Indications.* I. To remove the exciting cause. II. To improve the condition of the circulating fluid. The exciting cause may be removed, in the several cases specified, by proper diet, exercise, change of air, ventilation of apartments in which unhealthy occupations are carried on, change from unwholesome employments to healthy occupations. In the case of syphilitic cachexy a new action must be induced in the system by preparations of mercury or of iodine. The condition of the circulating fluid may be improved by a diet consisting of a due mixture of animal and vegetable food. The condition of the digestive, cutaneous, urinary, and uterine functions must be carefully inquired into, and the nature of the secretions determined. If the bile be vitiated and defective, alkalies combined with tonics, and mercurial purgatives, should be given. The condition of the urine will generally indicate the treatment which should be adopted. If it be loaded with phosphates or oxalates, the mineral acids may be given in combination with quinine. If lithates be present, alkalis, with tonic and stimulant infusions, are required. The skin must be roused into healthy action by means of daily shower or sponge baths, followed by friction of the surface with a brush or coarse towel. If the temperature be low, an occasional hot bath should be taken at bedtime. Change of air and of scene, and chalybeates or saline waters, may be resorted to with the greatest benefit.

Of the varieties of cachexia specified above, some will be found sufficiently described under the diseases which produce them; others, as leucocythæmia and supra-renal cachexia, require separate notice.

LEUCOCYTHÆMIA, LEUKÆMIA, LYMPHÆMIA, is a form of cachectic anæmia, for a knowledge of which we are indebted to Dr. Bennett of Edinburgh. The disease derives its name from an excess of white corpuscles in the blood. It is characterised by great pallor of surface, accompanied in some cases by œdema, or by dropsical effusions of greater or less extent. The functions of the stomach and bowels are generally deranged, and jaundice is sometimes present. There is great weakness and emaciation, shortness of breath, and, in cases of long standing, hectic fever. The blood is found to contain white corpuscles in great excess. The disease is generally one of adult life, and is commonly associated with disease of the liver and spleen, especially the latter, which is often greatly enlarged. Disease of the lymphatic glands is also a common accompaniment. The disease is essentially chronic, and the prognosis unfavourable, except in those rare cases in which the viscera are not seriously affected.

The cause of the disease is sometimes to be found in severe attacks of remittent or intermittent fevers, leaving behind them disease of the liver and spleen. The treatment will consist in the simultaneous use of preparations of iron, and of the remedies indicated for the concomitant visceral disease.

Virchow distinguishes two forms of leukæmia, the *splenic* and the *lymphatic*, the spleen being the starting-point of the disease in the one, and some portion of the lymphatic glands in the other: in the splenic form the white corpuscles of the blood are comparatively large, well-developed cells, with one or more nuclei closely resembling the cells of the spleen. In the lymphatic form the white blood corpuscles are small, and each has a single, somewhat granular nucleus, closely attached to the cell-wall. "In many instances it looks as if perfectly free nuclei were contained in the blood."

CACHEXIA OF HOT CLIMATES.—This is of common occurrence in Europeans resident in hot climates: sometimes as the consequence of organic disease of the abdominal viscera brought on by previous attacks of intermittent or remittent fever; sometimes as the result of a prolonged residence in unhealthy localities without any precedent organic malady; sometimes, again, as the sequel of febrile attacks, not followed by organic mischief. It may also be induced by the injudicious use of the lancet, or by attacks of diarrhœa, cholera, dysentery, scurvy, or hepatitis. The leading symptoms are, a pale and sallow countenance, a cold and shrivelled skin, a pearly whiteness of the eye, a dilated pupil, a dull and languid expression of features, a peevish temper, and a despondent state of mind. The belly is generally swollen, and the extremities often œdematous, the digestion weak, the bowels torpid, the tongue pale, and coated with a white fur, the pulse feeble, and the respiration easily quickened by exertion. The treatment proper for this state consists in the use of the preparations of iron, with aloetic aperients, if required, and such local treatment as the visceral complications require, with strict attention to all the means of preserving health. A dry and bracing air, mental rest, and suitable bodily exercise, must be particularly insisted on. Preparations of mercury are contra-indicated.

I have, in one or two instances, seen this state of system following service in hot climates and attacks of intermittent or remittent fever, without, however, any serious disease of the liver or spleen, speedily and entirely cured by the use of preparations of steel. (G.)

SUPRA-RENAL CACHEXIA.—*Supra-renal Melasma, Morbus Addisonii.*—This is a form of cachexia characterised, like leucocythæmia, by great pallor of surface, pearly whiteness of the conjunctiva, great languor and debility, loss of appetite, an uneasy feeling at the pit of the stomach, and sometimes vomiting of food, feeble pulse, and some loss of flesh. This anæmic and cachectic state is accompanied by a peculiar and characteristic discoloration of the skin over the whole surface of the body, but more particularly on the face and neck and under the eyes, on the penis and scrotum, the armpit and navel, the epigastrium and upper extremities. The skin has a smoky appearance, and presents every shade of colour from amber to dark chestnut, or even a chocolate colour. It is sometimes blended with spots or patches of morbid whiteness. The discoloration may also affect the inside of the cheeks and the lips, which sometimes have the appearance caused by eating mulberries. The cases in which this discoloration is extensive and strongly marked, end fatally.

CAUSE.—Doubt still remains in the minds of many as to the connection between these symptoms and disease of the supra-renal capsules. We are indebted to Dr. Headlam Greenhow for having collected and analysed all the published cases of so-called Addison's disease. The following are the results at which he has arrived:—There were ten cases of bronzed skin in which the supra-renal capsules were healthy; twenty-four in which they were in part or wholly destroyed by cancerous deposit but in eight only of which was there any cutaneous discoloration approaching to bronzing; thirty-four cases of miscellaneous affections of the capsules, in only sixteen of which was there any decided bronzing; fifty-nine cases in which the degeneration of the capsules was associated with tubercular and vertebral disease; twenty-three in which the capsular disease was associated with phthisis and other serious diseases; five in which the state of the other organs was not reported; thirteen in which the supra-renal disease was complicated with disease of the mesenteric and intestinal glands, or of the lungs or pleura; and only twenty-eight cases in which the disease of the capsules was absolutely unaccompanied by constitutional disease. In even some of these latter, death may have been due to general fatty degeneration and asthænia, for some of the subjects were overladen with fat. Dr. Greenhow rejects the first sixty-four cases in this enumeration as spurious examples of Addison's disease.

MIMOSIS INQUIETA—THE NERVOUS STATE.

SYMPTOMS.—Flushings, tremblings, palpitations, dyspnœa, pain in the left side, giddiness, loss of recollection, depression of spirits, anxiety, and timidity. In extreme cases the patient is startled by the slightest noise; is in constant apprehension of death, or of some great evil about to befall him; he imagines that he has done something wrong; or is in constant fear that he may commit some great crime. The sleep is often disturbed by frightful dreams. Neuralgic pains, with extreme weakness of the hands and forearms, are of common occurrence, and gives rise to an unfounded alarm of paralysis. There are indigestion and flatulence, and the bowels are frequently costive. In other respects the health does not suffer materially. The patient often looks well, does not lose flesh, and may even be of a full habit of body. In women, faintings and hysterical paroxysms are sometimes superadded, and the disease occasionally terminates in mania.

CAUSES.—*Predisposing.* A nervous temperament. Excessive discharges, such as hyperlactation, leucorrhœa, menorrhagia, diarrhœa, and repeated loss of blood, the change of life, in the female sex. *Exciting.*

In both sexes, fright, grief, anxiety, overwork, scanty nourishment, or fatigue. In men, excessive study, anxiety, dissipation, and sexual abuse.

DIAGNOSIS.—From serious nervous diseases, such as delirium tremens, and mania, by the absence of delirium, and of obstinate delusions.

PROGNOSIS.—Favourable, but recovery generally slow and tedious.

TREATMENT.—I. Support the patient's strength by the use of astringent tonics (Form. 167), a generous diet, a moderate amount of wine, fresh air, and exercise. II. Allay the nervous irritation by the use of sedatives, such as opium, hyoscyamus, and digitalis.

FEBRICULA—THE FEBRILE STATE.

SYNONYMS.—Febris ephemera. Simple fever. Feverishness.

DEFINITION.—A continued fever, of slight degree and short duration, which often runs its course in twenty-four hours.

SYMPTOMS.—Increased heat of skin and frequency of pulse, flushed face, slightly furred tongue, thirst, loss of appetite, restlessness, lassitude, and wandering pains in the head, back, and limbs, are the ordinary symptoms of the febrile state. They are sometimes ushered in by shivering, and generally pass off by perspiration.

CAUSES.—Fatigue; exposure to cold; heated rooms; intemperance in eating or drinking; slight local inflammation. The contagion of typhus fever acting on a strong constitution, or that of any of the exanthemata acting on a person who has already had the disease.

DIAGNOSIS.—From severe forms of continued fever by the mildness of the symptoms. Caution, however, is necessary in expressing an opinion, as at the first onset of severe cases of continued fever and of the febrile exanthemata, the symptoms are often not strongly marked.

PROGNOSIS.—Favourable, but guarded, for the reason just stated.

TREATMENT.—I. If the febrile attack have originated in intemperance in eating or drinking, an emetic should be administered.

II. The feverish symptoms will generally yield to a saline aperient (Form. 259), and low diet. In more severe cases, ten grains of Dover's powder may be given at bed-time, followed by a saline aperient in the morning. The patient should keep his bed for a day, and be restricted to tea, farinaceous food, and cooling drinks.

CHAPTER II.

Phlogosis	Inflammation.
Congestio	Congestion.
Hæmorrhagia	Hæmorrhage.
Hydrops	Dropsy.
Erysipelas	St. Anthony's Fire.

PHLOGOSIS—INFLAMMATION.

Varieties.—1. Acute. 2. Chronic.

1. Acute Inflammation.

Symptoms.—These are—(1.) Local. (2.) General or Constitutional.

(1.) *Local Symptoms. When External.*—Redness, swelling, heat, and pain. The *redness* arises from the increased quantity of red blood contained in all the vessels of the part; the *swelling* from the same cause, combined with the exsudation of serum, albumen, or lymph; the *heat* exceeds that of other superficial parts, but never rises higher than that of the blood; the *pain* is explained by the larger supply of blood to the nerves of the part, combined with the pressure of the surrounding texture upon them. It is accordingly most severe when the surrounding textures are most unyielding, as in whitlow; comparatively slight, or only produced by external pressure, in the lax mucous membranes. *When internal.*—There is pain and disturbance of function. The pain, in parts which can be submitted to pressure, is increased by that pressure, and this forms an important means of diagnosis; and, in the less severe forms of inflammation, pain not existing before is sometimes brought out by pressure. The *disturbance of function* in secreting organs, consists in alteration, diminution, or total suppression of their appropriate secretions, according to the degree of the inflammation; in other organs, it consists of various degrees of excitement—in the brain, rapid succession of ideas, mental irritation, delirium; in the eye and ear, intolerance of light and sound, or false sensations, such as flashes of light, musical notes, &c.; in the lungs, dyspnœa; in the heart, palpitation.

(2.) *General or Constitutional Symptoms.*—In healthy persons, the group of symptoms commonly known as *Inflammatory Fever*; namely, rigors, succeeded by pains in the head, back, and limbs; lassitude; nausea, and loss of appetite; increased heat of surface; thirst; furred tongue; frequent, full, hard pulse; dry skin; scanty, and high-coloured urine; and constipation. There is a slight aggravation of the symptoms towards evening, and a slight remission in the morning. The sleep is disturbed, and the patient is somewhat delirious. After blood is drawn it is found cupped and buffed.

In severe and extensive inflammation, or in unhealthy persons, the symptoms are those of *Constitutional Irritation:* characterised by extreme anxiety and restlessness; hurried respiration; rigors; a frequent, quick, sharp pulse; low muttering delirium; and in fatal cases, death by exhaustion.

In extremely debilitated subjects, hectic fever is commonly present as soon as pus is formed.

TERMINATIONS.—1. Resolution. 2. Increased secretion. 3. Hæmorrhage. 4. Adhesion. 5. Softening. 6. Induration. 7. Suppuration. 8. Gangrene.

CAUSES.—*Predisposing.* Sanguine temperament; full habit of body; general debility; cachectic and febrile states of system. *Exciting.*—1. Mechanical and chemical irritants. 2. Cold and heat. 3. An altered or poisoned condition of the blood. 4. Local congestion, from imperfect elimination of effete matters.

CAUSES WHICH MODIFY THE CHARACTER OF INFLAMMATION:—

1. Texture. 2. Condition of System. 1. *Texture.*—The *serous* membranes when acutely inflamed take on the adhesive inflammation, very rarely the suppurative; in less degrees of inflammation, they pour out serum or liquid albumen. The *mucous* membranes secrete mucus, pus, and. in rare cases, coagulable lymph, and are prone to suppuration and to softening, but not to adhesion of opposed surfaces. Inflammation of the *cellular* tissue causes a secretion of serum, and, in higher degrees of inflammation, of coagulable lymph and pus. Its common termination is by *abscess.* Inflammation of the cellular tissues is called *phlegmonous* inflammation. The *parenchymatous* substance of organs is apt to be softened by acute, and hardened by chronic inflammation; it is also liable to abscess and gangrene. Of the *fibrous* tissues, tendon and ligament are prone to gangrene, cartilage to ulceration. *Osseous* inflammation terminates in gangrene (caries and necrosis). The *skin* resembles the mucous membranes in being prone to suppuration. Diffused redness, pimples, and gangrene are also common terminations of cutaneous inflammation. Vesicles, pustules, and spots of ulceration and gangrene also occur on the skin, and constitute a great variety of skin diseases.

The general, or constitutional symptoms of inflammation also vary materially with the tissue affected. In inflammation of the *serous membranes*, there is little heat of surface, little muscular debility, little tendency to delirium, unless the serous membranes of the brain be affected; the pulse is hard; there is acute pain, great tolerance of loss of blood, an excess of fibrine, and a cupped and buffed appearance in the blood itself. In inflammation of the *mucous membranes*, on the other hand, there is little pain, little tolerance of loss of blood, no increase of fibrine, and the absence of the cupped and buffed appearance.

2. The plethoric are liable to boils, carbuncles, and adhesive inflammation of the serous membranes. In the anæmic there is but little tendency to inflammation, and when it occurs, it is subacute, and generally

results in serous effusions and acute œdema. In the cachectic state there is liability to those low forms of inflammation which result in the deposition of croupy or diphtheritic exsudation upon the mucous membranes; in the formation of tubercle in the lungs and lymphatic glands; or the outpouring of sero-purulent fluid into the serous cavities.

It is of the utmost importance that the practitioner should be familiar with the constitutional symptoms which mark the several terminations of inflammation. *Acute adhesive inflammation* is accompanied by a full, strong, and hard, or a small wiry pulse, somewhat increased in frequency, little or no heat of skin, little or no headache, vertigo, or delirium, no muscular tremor or debility, slight change in the character of the urine, and great tolerance of bloodletting. *Suppuration* is announced by burning, throbbing pain, by severe and often by repeated rigor, occurring in some cases almost with the regularity of ague, and followed by heat and sweating—the symptoms, in fact, of hectic fever. *Gangrene* is indicated by a sudden cessation of pain, by collapse of the entire system, pallor, cold clammy sweat, sunken features, sometimes low delirium, sometimes peculiar self-possession. A dry, brown tongue, sordes on the teeth, a small, frequent, feeble pulse, and the other symptoms of the typhous state, usually precede the fatal termination of extensive or long-continued inflammations.

TREATMENT.—The remedies employed in the treatment of *acute* inflammation are either general or local. The *general remedies* are bloodletting by venæsection or arteriotomy, the tartarated antimony, in full doses of a fourth of a grain or more, and the preparations of mercury, especially calomel and blue pill, administered in repeated doses, so as to produce slight constitutional effects. In slight inflammations the use of strong saline aperients will be sufficient. In internal inflammations, diaphoretics, aided by the hot bath, are of the greatest service. The *local remedies* are depletion by leeches, cupping, or scarification, incisions into the part, cold, cataplasms and fomentations, and counter-irritants. Inflammation of exposed mucous surfaces is often treated by strong irritants, such as nitrate of silver, which have the effect of promoting the contraction of the dilated vessels. Another effective local remedy is pressure, which has been applied with advantage in orchitis and in anthrax.

2. CHRONIC INFLAMMATION.

SYMPTOMS.—Those of the acute form, but less intense, and of longer duration. The redness is of a more dusky hue; the heat little, if at all, above the natural standard, and the pain very slight, or only produced by pressure. The functions of internal parts when thus inflamed are generally languid, and their secretions are diminished in quantity. In chronic inflammation of the cellular tissue, serous effusions usually take the place of the more solid products of acute inflammation.

TREATMENT.—This is chiefly by local remedies, of which those most in use are, moderate depletion by leeches or cupping, stimulants, which cause the capillaries to contract, and counter-irritants. Of stimulants, the most efficacious are nitrate of silver, tincture of iodine, iodine ointment, &c., applied over and around the inflamed part. The capillaries may also be caused to contract, and chronic effusions may be removed, by the cold douche, or by electric shocks passed through the part affected. In chronic inflammation of the lower extremities, a graduated pressure is also of great service, by supporting the relaxed vessels. Iodine and its preparations are of use internally to promote the absorption of effused material.

CONGESTIO—CONGESTION.

VARIETIES.—1. Active. 2. Passive.

1. ACTIVE CONGESTION.—Sthenic or active Hyperæmia.

CHARACTERS.—A local fulness of the small vessels, analogous to that general fulness which constitutes plethora; this fulness being accompanied by a more rapid flow of blood, attended by the same florid redness which is present in inflammation.

TERMINATIONS.—In inflammation. In active hæmorrhage. In passive congestion. In dropsy.

TREATMENT.—When congestion threatens to run on into inflammation, the moderate abstraction of blood from the part by leeches or cupping, a position favourable to the return of blood to the heart, the local application of cold, counter-irritants, and the administration of saline aperients and tonic stimulants, are indicated.

2. PASSIVE CONGESTION.—Passive or Asthenic Hyperæmia.

CHARACTERS.—Distension of the capillaries and small veins, a languid circulation of blood through the part, and a dusky hue.

TERMINATIONS.—In active congestion, passing on into inflammation. In oppressed and sluggish function. In dropsy. In passive hæmorrhages, leading to chronic ulcers of the extremities.

CAUSES.—Mechanical pressure. Obstruction to the flow of blood through the lungs, the heart, or the liver. A position unfavourable to the free return of blood to the heart. Constitutional debility. Cold. Imperfect action of secreting and excreting organs.

TREATMENT.—Must be suited to the cause. Leeching; dry cupping; friction. In congestion of the mucous membranes, and in congestion or chronic ulceration of the integuments, the use of stimulant and astringent applications. The moderate use of aperient medicines, to relieve the general circulation; of stimulants to excite it; and of tonics to support it.

HÆMORRHAGIA—HÆMORRHAGE.

When hæmorrhage arises in healthy states of system from strong action of the heart, it is called *active;* when from a weakened state of capillaries, *passive:* that which arises from congestion might be termed with equal propriety *congestive* hæmorrhage.

1. ACTIVE HÆMORRHAGE.

CHARACTERS.—A sudden discharge of bright-coloured blood.

CAUSES.—*Predisposing.* Youth and vigour. Plethora. *Exciting.* All excitements of the circulation by violent muscular exertion; the abuse of spirituous liquors; violent passions and emotions. The *immediate* cause may be the rupture of a large artery, or of an aneurismal sac; active congestion of a mucous surface leading to extravasation; the laying bare of an artery by ulceration; and severe wounds.

TREATMENT.—That appropriate to acute inflammation, nauseating doses of tartar emetic (Form. 210), brisk saline aperients, and low diet. A position unfavourable to the flow of blood towards the seat of the hæmorrhage. Quiet and rest of the part affected. Cool air and cooling drinks. Cold applications. Ice. Styptics. In debilitated constitutions, in addition to a proper posture, rest, cool air, and cooling drinks, astringent medicines should be prescribed, such as the mineral acids, especially the sulphuric, the preparations of zinc and lead, and vegetable substances containing tannin or gallic acid. In all cases of extreme debility, with great pallor of surface, brought on by excessive hæmorrhage, opium and its preparations in full doses are indicated, either by themselves or in combination with astringents (Form. 83).

2. PASSIVE HÆMORRHAGE.

CHARACTERS.—A slow discharge of dark-coloured blood by extravasation from mucous or other surfaces in a state of passive congestion.

TREATMENT.—That of passive congestion, suprà.

HYDROPS—DROPSY OR ANASARCA.

DEFINITION.—An effusion of serum into the interstices of the areolar tissue, with or without effusion into serous cavities.

Œdema is the term given to local effusions into the areolar tissue. Effusions into the several cavities of the body are respectively called *hydrocephalus, hydrorachis, hydrothorax, hydropericardium, ascites, ovarian dropsy, hydrocele.*

VARIETIES.—The varieties of dropsy are dependent upon their *cause.* Thus there exist (1) mechanical dropsy, (2) dropsy from debility, (3) febrile and renal dropsy, (4) pulmonary dropsy, (5) cardiac dropsy, (6) hepatic dropsy.

SYMPTOMS.—The disease generally first shows itself towards evening with a swelling of the feet and ankles, which disappears after lying down. By degrees the swelling becomes permanent, ascends, and successively affects the thighs, the integuments of the trunk, the penis and scrotum, or the labia. In extreme cases the dropsical effusion extends to the upper extremities, and to the integuments of the chest, neck, and face. Effusion into one or more of the serous cavities almost invariably accompanies such a condition. The parts occupied by the fluid *pit* on pressure with the finger. Except in renal dropsy, the urine is scanty, high-coloured, and deposits lithates. The skin is pallid like marble, cold, and dry, and when the effusion is great, it becomes tense and shining. By-and-by it gives way at several points, the water oozes out, and the contiguous skin becomes red and excoriated; sometimes it is raised up into small blisters, sometimes it sloughs. Dyspnœa, palpitation, flatulence, and drowsiness are commonly associated with dropsy.

CAUSE.—With a view to prognosis and treatment it is of the utmost importance to ascertain the cause of the dropsy, and thus to distinguish the different varieties of the disease. In some cases the acumen of the physician will be severely tested. The following are the chief points to be attended to:—1. If the dropsy be purely local or asymmetrical, it is dependent upon *mechanical obstruction* of a particular large vein—*e.g.*, œdema of head, neck, and upper extremities may be due to an aneurismal or other tumour pressing against the descending cava. Œdema of the leg may arise from the pressure of a cancerous mass in the pelvis upon the corresponding iliac vein. 2. *Dropsy from debility* will be recognised by attention to the previous history of the patient. There is no history of rheumatism or scarlet fever, and there are no present symptoms of organic disease of either of the great organs. There may be a soft bruit at the base of the heart; but we shall have no great difficulty in assigning this to its proper cause—anæmia. 3. *Acute or febrile dropsy* is known by its sudden appearance following exposure to cold, as when a person, after violent exercise and in a profuse perspiration, falls asleep on the cold damp ground; or when, during recovery from scarlatina, the action of the skin is checked by exposure to cold, wind, or rain. This variety has its origin in severe congestion of the kidneys, as indicated by the scanty, albuminous, bloody, or coffee-coloured urine. *Chronic forms of renal dropsy* will also be indicated by the condition of the urine, and the absence of severe cardiac and pulmonary symptoms. In these grave diseases the urine is pale, like whey, highly albuminous, and usually deposits a slight cloud composed of casts of the uriniferous tubules. (See acute and chronic nephritis.) 4. *Pulmonary dropsy* generally follows an acute attack of general bronchitis in one who has long suffered from emphysema. In other cases we may detect consolidation of the lung from cancer or tubercle, or the lungs themselves may be œdematous from local debility of their structure. 5. *Cardiac dropsy* is most commonly due to disease of the valves of the heart allowing of regurgitation of the blood, and resulting in obstruction to the entrance of venous blood into the lungs, and consequent congestion of the venous system. Occasionally the cause lies in a fatty heart. Abnormal heart-sounds and a feeble, intermittent pulse point out these conditions. 6. *Hepatic dropsy* is readily known from that arising from other causes, by the history of the patient, the presence of excessive ascites before the appearance of swelling in the legs, the condition of the liver, the absence of swelling from the upper parts of the body, and scanty bilious urine loaded with lithates and usually free from albumen. (See Cirrhosis, Cancer of the Liver.)

PROGNOSIS.—Favourable, excepting when dependent on organic disease of long standing, and great severity.

TREATMENT.—*Indications.* I. To remove the cause. II. To diminish the quantity of the fluid. III. To relieve urgent symptoms by its discharge.

I. In inflammatory dropsy and that dependent on febrile action, the remedies for inflammation and fever are indicated ; in dropsy dependent on debility, tonics or stimulants according to the degree of the debility ; in dropsy dependent on venous congestion, moderate depletion to relieve the vessels, and regulated pressure to afford support ; in congestive dropsy dependent on organic disease, medicines directed to relieve the disease which causes the congestion ; and in dropsy from organic disease leading to an alteration in the constituent principles of the blood, a treatment appropriate to the disease in question.

II. The quantity of the effusion may be lessened by remedies which increase the secretions of the skin, kidneys, and bowels—by sudorifics, diuretics, and purgatives adapted to the state of the patient. Among sudorifics, the salines are to be preferred, such as nitrate of potass, acetate of ammonia, &c. ; among diuretics, the salts of potass or soda, in combination with some of the diuretic infusions or decoctions ; and among purgatives, the saline aperients, the compound jalap powder in doses of from gr. xx. to gr. lx., and the extract of elaterium in doses of from gr. $\frac{1}{4}$ to gr. i. The doses and strength of the several remedies must be regulated by the state of the patient, the sudorifics and diuretics belonging to the class of depressants being preferred in inflammatory and febrile dropsy, and in comparatively vigorous states of the system ; and sudorifics and diuretics belonging to the class of stimulants in states of debility. The saline purgatives will be more appropriate in the latter form, and more drastic purgatives in the former. Cardiac, hepatic, and renal dropsy also require modifications of treatment, and remedies adapted to the primary disease. (See the Diseases of the Heart, Liver, and Kidney.)

III. When dropsical accumulations interfere mechanically with the functions of surrounding parts, it may be necessary to resort to operations in order to discharge the fluid, viz. acupuncture, in anasarca threatening to discharge itself by vesication, or ulceration of the skin ; paracentesis abdominis, in ascites, in hydrothorax paracentesis thoracis : in hydrocele tapping, followed by stimulant injections to effect a radical cure

ERYSIPELAS—ST. ANTHONY'S FIRE.

Definition.—A contagious malady, epidemic at certain seasons, consisting in an inflammation of the skin, or of the skin and cellular tissue, spreading from a single centre over a greater or less extent of surface, and subsiding, or disappearing in one part as it extends to another.

Varieties.—1. Idiopathic erysipelas. 2. Traumatic erysipelas.

1. Idiopathic Erysipelas.

Symptoms.—The disease usually sets in with rigors, and other symptoms of pyrexia; with confusion of intellect, and sometimes with delirium or coma. There is nausea, and, in some cases, vomiting; in others diarrhœa; the tongue is moist, and covered with an uniform white fur; and the pulse is frequent, quick, full, and compressible. After a variable interval of a few hours, or of one or two days, a red spot, accompanied by more or less swelling, appears on the skin. From this centre an inflammatory blush of a rosy, bright scarlet or dusky red colour spreads more or less rapidly, fading away into the healthy skin. The inflammatory area rapidly extends, and the affected and contiguous portions of the integuments become more or less œdematous. As the redness extends, it disappears from, or gradually subsides, in the parts first occupied. After a longer or shorter time the inflammation usually terminates in desquamation of the cuticle, or in the formation of vesicles of variable size, containing a yellowish serum or lymph. The fever is in proportion to the extent of the disease, and only declines after it has ceased to spread, when, in favourable cases, the patient rapidly regains appetite and strength. In unfavourable cases, the fever assumes the typhous character, passes through the several stages, and displays many of the symptoms described under 'Typhus Fever' (see page 288), and the patient sinks comatose or exhausted from the fifth to the tenth day; rarely so late as the fourteenth or twenty-first.

Terminations.—1. Resolution (*erysipelas mitius*). 2. Vesication and desquamation of the cuticle. 3. Œdema (*erysipelas œdematodes*). 4. Inflammation of cellular membrane (*erysipelas phlegmonodes*), with consequent suppuration, or gangrene (*erysipelas gangrænosum*). 5. Pyæmia. 6. The disease sometimes suddenly leaves one part of the surface, and attacks a distant part (*erysipelas erraticum*). 7. Inflammation of the brain and its membranes. 8. Inflammation and suppuration of the mucous membrane of portions of the intestinal canal. 9. Inflammatory œdema of the glottis producing suffocation.

Erysipelas of the face (*erysipelas faciei*) is by far the most common form. It commonly begins on the nose, and thence gradually extends over the entire face, causing great swelling of the nose and eyelids, and, in extreme cases, giving rise to horrible disfiguration. Sometimes it descends and spreads over the neck and trunk, but more commonly attacks the scalp. In its passage over the head, the membranes of the brain are often more or less affected, and there is acute headache, accompanied sometimes by delirium of the violent or of the muttering kind, and occasionally terminating in coma. From the head it generally extends down the back, and sometimes affects the membranes of the spinal cord. In severe cases, traces of the affection of the membranes of the brain and spinal cord remain for some time, and are shown by mental excitement, and by numbness and spasmodic twitchings of the extremities. Erysipelas of the head and face is generally accompanied by more or less inflammation and redness of the throat, and in rare instances it proves fatal by inducing serous effusion into the submucous tissue of the glottis and epiglottis.

PATHOLOGY.—A special inflammation of the blood-vessels and lymphatics of the skin, which may terminate in resolution or in the formation of pus within these vessels. In the latter case symptoms of pyæmia may appear.

MORBID ANATOMY.—Inflammatory or purulent deposits may be found in the viscera, especially the lungs; and upon the serous and mucous membranes.

CAUSES.—*Predisposing.* A full plethoric habit; constitutional peculiarity; previous affections of the same nature. The adult age: debilitating diseases, such as dropsy, renal dropsy especially, fever, or the febrile exanthemata. *Exciting.*—Contagion; cold; excessive heat, or vicissitudes of temperature; exposure to the rays of the sun; abuse of fermented liquors; suppressed evacuations; the presence of irritating matter in the alimentary canal; wounds or local inflammation of the common kind occurring in certain constitutions, in certain seasons, and in places where the disease already exists. It is often epidemic during spring and autumn, frequently prevailing in hospitals, gaols, and other crowded situations; and it is a frequent concomitant of puerperal fever.

DIAGNOSIS.—From *erythema* by the duskier blush, pain, and swelling, and by the presence of severe pyrexia. *Erythema nodosum* does not tend to diffuse itself, and is never accompanied by pyrexia. *Acute eczema* is liable to be confounded with erysipelas. It is distinguished by the presence of a minute vesicular eruption.

PROGNOSIS.—*Favourable.* The fever purely inflammatory; a rosy or bright scarlet colour of the diseased skin; not extending over a large surface; no vesications; the febrile symptoms diminishing with the disappearance of the blush; and this, soon after, assuming a yellowish hue, with an abatement of the swelling. The adult age. *Unfavourable.*—The fever assuming the typhous form; the inflammation becoming of a dark rose-colour; its sudden recession from the surface, and invasion of an internal part; its extension over a large surface without leaving the part it first occupied; livid vesications; weak, rapid, irregular pulse; great prostration of strength; early appearance of coma; the disease being epidemic; original or acquired debility; complication of the disease with dropsy, jaundice, or other affections originating in organic disease. Infancy and old age.

Contagion—Infection.—The disease chiefly spreads by contact; it is doubtful whether it is ever propagated through the air. It may be inoculated, and it is conveyed by fomites. It may attack the same person several times, and may coexist with other severe diseases: its period of incubation from a few hours to two or three weeks. It is an epidemic malady, and rages in some years with extreme violence.

Mortality.—The deaths in the metropolis, in a million of persons of all ages, vary from 110 to 260, and average 160. The *rate* of mortality among persons attacked varies with the severity of the epidemic, from one in three to one in ten; or it is even less.

Treatment.—*Indications.* I. To subdue inflammation, and promote salutary changes in the part affected.

II. To support the strength of the patient.

III. To obviate the tendency to a determination to the head or other important organs.

I. The general inflammatory action will be greatly relieved by free excretion from the alimentary canal, the kidneys, and the skin. A full dose of compound jalap powder may be given once or oftener, and followed by repeated doses of acetate of ammonia (℥ss. P. B.), combined with gr. v to gr. x of carbonate of ammonia. To subdue the topical inflammation, we may apply warm fomentations, such as decoction of poppy heads. The part may previously be rubbed over with solid nitrate of silver. Light bandaging is of great service where it can be applied. In every case the inflamed skin should be carefully covered from exposure to the air, and where hot flannels or poultices cannot be conveniently applied, we may use flour, starch powder, carbonate of zinc, or simply cotton wool. A mixture of two parts of collodion and one of castor oil forms a very complete protection to the inflamed skin. It is elastic, and by its contraction gives the required support to the swollen parts. It should be thickly painted on by means of a camel's-hair brush.

II. As the disease is essentially an adynamic one, recourse must be freely had to stimulants, as wine and ammonia, and to the stronger stimulants in persons previously accustomed to their use. These may be combined with opium, which is often found very serviceable, even when the brain is affected.

Tincture of the perchloride of iron in ♏xxx—♏xl doses alone, or in combination with quinine, every three or four hours, is a valuable tonic in erysipelas. If a diffusible stimulant be required, those given in Forms. 6, 14, may be prescribed.

When the patient is very restless, full doses of opium must be given. The presence of delirium does not contraindicate the use of wine and quinine, if the other symptoms and the general state of the patient require their use.

If the disease tends towards a typhous character, we must depend upon stimulants chiefly. As much as a pint of wine or brandy may be needed in the twenty-four hours. The latter may be given in the form of the Mistura Vini Gallici of the Pharmacopœia. The diet should consist of egg emulsion, thin gruel, and beef tea. The iron may be continued during convalescence, or, if need be, quinine and acid may be substituted.

III. In cases of head affection with coma and delirium, much relief will be afforded by the application of sinapisms to the feet, mustard pediluvia, or a blister between the shoulders. Evaporating lotions or ice, may simultaneously be applied to the head. If the patient become very noisy and restless a full dose (gr. i—ii) of opium will be required. Diseases of other internal organs must be treated by the remedies applicable to similar idiopathic diseases, taking into account the patient's strength. If the inflammation disappear from the surface, and attack an internal part by *metastasis*, strong stimulants, as mustard poultices, acetum cantharidis, or hot water, should be applied to the corresponding part of the surface.

In phlegmonous erysipelas, the inflammation may be relieved by scarifications; great tension of the integument by incisions. The incision must be free and deep if sloughing have occurred, or matter formed; we must use poultices and disinfectants continuously.

PROPHYLAXIS.—Cleanliness, separation, and, if practicable, isolation. Apartments which have been occupied by erysipelatous patients should be whitewashed and thoroughly cleansed. Two causes are active in propagating, if not in generating the disease in our hospitals;—*the use of sponges in dressing wounds*, and *wet scrubbing of the floors of the wards.* To avoid the first, fine tow should supply the place of sponges, a fresh bit being used for each patient. Sponges used in the operating theatre should be thoroughly washed and subsequently immersed in boiling water after each operation. To avoid the second cause, dry rubbing should be substituted for washing. The floors should never be wetted so long as patients are lying above them.

2. TRAUMATIC ERYSIPELAS.

In certain seasons, when idiopathic erysipelas is very prevalent, slight wounds and injuries are apt to be followed by erysipelatous inflammation; and wounds or injuries of a more severe character in persons of unsound constitution, or in the healthy inmates of hospitals or public institutions where the disease already prevails, are almost uniformly subject to this complication. The disease often appears in lines extending from the injured toe or finger along the leg or arm; the lymphatic glands become affected, and those of the axilla, in particular, are liable to diffuse inflammation and suppuration. The symptoms due to traumatic erysipelas do not differ from those of idiopathic erysipelas, and the treatment will be the same. But in the prognosis, the original injury and the consequent erysipelas will have to be jointly considered, and as pyæmia is a more common result in this variety of the disease, our attention must be constantly directed to the lungs and pleura.

CHAPTER III.

FEBRES—FEVERS.

Class I.

Non-infectious Fevers.

I.	Febricula	Simple Fever (see p. 265).
II.	Febris Intermittens	Ague.
III.	Febris Remittens	Remittent Fever.
IV.	Febris Icterodes	Yellow Fever.

Class II.

Infectious Fevers.

I.	Typhus	Epidemic Continued Fever.
II.	Enteric or Typhoid	Endemic Continued Fever.
III.	Relapsing Fever	Famine Fever.
IV.	The Exanthemata.	(See Chapter IV.)

General Observations on Non-infectious Fevers.

Febricula has been already described. It is caused by some derangement of the functions of the body. Ague, remittent and yellow fevers, are endemic, and originate in one common external cause; viz., marsh miasma. Apart from their common origin, they have so many other resemblances that we may safely assume them to be varieties of one and the same disease, the differences being due to the variation in power or intensity of the primary or exciting cause. Thus, if the marsh poison introduced into the system be small in amount, the body suffers only occasionally, a febrile attack coming on every second or third day, or after longer intervals. If the dose be larger, the interval between the paroxysms are shorter and are no longer intermissions—intervals of freedom from fever,—but mere remissions of a more intense febrile condition. If, again, the system receive a still more powerful dose of the paludal poison, the fever becomes continuous, and those internal organs which, in the former cases, were comparatively little affected, are now fearfully deranged. Between intermittent and remittent fevers, and between remittent and yellow fevers, there are, in truth, no lines of demarcation; they run into each other most completely.

Given a certain source of paludal miasma, the intensity of the fever generated by it will be, *cæteris paribus*, in proportion to the external temperature. In the Arctic regions these fevers are unknown, and the mildest variety of them rarely passes beyond the fifty-sixth degree of latitude. In the latitude of London, and five degrees south of it, the disease assumes the intermittent type; south of this line it becomes remittent; still nearer the equator, remittent is not to be distinguished from yellow fever.

These fevers are of great interest and importance to a nation which has soldiers and sailors scattered over the whole of the habitable globe, and serving under circumstances of great exposure, fatigue, and privation. Remittent fever, though by no means unknown in England, assumes in some of our dependencies a character of great malignity, rivalling, and even surpassing, the oriental plague itself in the violence of its attack and the mortality it occasions. The records of our army serving abroad, show that even if we include stations in which the disease is unknown, or of very rare occurrence, one soldier in every eight is attacked by remittent fever, of which number at least one eighth die. If, however, we exclude from our calculation the stations in which remittent fever is wholly or nearly unknown, the attacks exceed 1 in 7, and the deaths amount to between a seventh and an eighth of those attacked. The mortality, however, varies very widely in different places. In the Tennaserim provinces, it is as low as 1 in 27, at Bombay 1 in 25, at Malta 1 in 24; while it destroys 2 in 11 in Ceylon, 4 in 11 in the Bermudas, and 1 in 2 in Western Africa, on which fatal coast the attacks are nearly equal to the number of soldiers.

The disease sometimes derives its title from the places in which it prevails. At other times from some prominent symptom. Thus we have the Walcheren, Levant, and Mediterranean fever; the jungle and hill fever of the East Indies; the lake-fever of America; the Bulam, Sierra Leone, African, and Bengal fever; the gall-fever of the Netherlands; the bilious remittent of the West Indies; and the yellow fever of Jamaica, Gibraltar, and the Bermudas.

The yellow fever, and the more severe forms of the disease, require for their development the combination of marsh effluvia and a temperature exceeding 75° Fahr. The low-lying spots near the coast are its favourite haunts, and it is believed to disappear at an elevation of about 2500 feet above the level of the sea.

FEBRIS INTERMITTENS—AGUE.

Synonyms.—Intermittent fever. Fever and ague.

Definition.—A fever caused by marsh miasma, and consisting of paroxysms,* occurring at regular intervals with perfect intermissions.

Varieties.—1. The *Quotidian;* a paroxysm once in 24 hours. 2.

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* The period between the end of one paroxysm and the beginning of the next is called the *intermission:* the period occupied by one paroxysm and one intermission is called the *interval.*

The *Tertian;* a paroxysm once in 48 hours. 3. The *Quartan;* a paroxysm once in 72 hours.*

SYMPTOMS.—Ague sometimes attacks a patient suddenly; but in most cases it is ushered in by symptoms similar to those which mark the onset of continued fever; and it is not till after several days, or even one or two weeks, that it assumes its perfect form. It is then recognised by the occurrence, at regular intervals, of a paroxysm consisting of three stages—a cold, a hot, and a sweating stage—following each other with great regularity. *The Cold Stage.*—Languor and listlessness; sighing, yawning, and stretching; pallor; blueness of the ears, lips, and nails: shrinking of the features; and constriction of the skin ot the whole body (*goose-skin* or *cutis anserina*); a sense of oppression at the pit of the stomach; violent shiverings, chattering of the teeth, and trembling of the limbs; pain in the head, back, and loins; the secretions diminished; the urine scanty, pale, and limpid; the pulse small, frequent, and sometimes irregular; and the respiration short and anxious. These symptoms terminate at length in universal and convulsive shaking. *The Hot Stage.*—The heat of the body gradually returns; at first irregularly by transient flushes, which are succeeded by a steady, dry, burning heat, rising much above the natural standard. The skin is now swollen, red, and pungent, the face flushed, and the eyes injected. The sensibility becomes preternaturally acute, and the aching of the head is exchanged for acute pain. The pulse becomes quick, full, and hard; there is great thirst; the urine is scanty and high-coloured. *The Sweating Stage.*—At length a moisture breaks out on the face and neck, which soon becomes a universal and equable perspiration. The heat now descends to its usual standard; the pulse resumes its wonted frequency and usual character; the respiration becomes free and tranquil; the urine deposits a sediment; and the patient is for a time restored to health.

OCCASIONAL SYMPTOMS.—In the cold stage, coma or apoplexy; in the hot stage, delirium. Convulsions, syncope, rigid spasms, neuralgia, jaundice, dysentery, and petechiæ on the skin, have also been recorded. In ague districts, and in persons who have previously had ague, many diseases assume the intermittent character. Of these, hemicrania, or intermittent face-ache, or brow-ague, is the most common.

DURATION OF THE PAROXYSM, &c.—The quotidian is most common in spring, and generally occurs in the morning: usual duration upwards of twelve hours. The tertian is a common type; it occurs both in spring and autumn, and commences at noon: usual duration about eight hours. The quartan is a rare type; it is more severe, occurs in autumn, and generally begins in the afternoon: usual duration about six hours. The quartan has the longest cold stage, the tertian the longest hot stage.

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* Also, 1. The *double quotidian*, having two paroxysms every day. 2. The *double tertian*, having a paroxysm every day, those of the alternate days being of equal duration and intensity. 3. The *triple tertian*, in which two paroxysms occur on one day, and one on the other. 4. The *duplicated tertian*, which returns twice on each alternate day. 5. The *double quartan*, in which a paroxysm occurs on the day succeeding that of the regular quartan, so that there is a perfect intermission only on the third day. 6. The *duplicated quartan*, in which two paroxysms occur on the day of attack, with two days of intermission. 7. The *triple quartan*, in which a slight paroxysm occurs on each of the usual days of intermission. These forms of ague, as well as those which have longer intervals (such as five, six, seven, eight, nine, or ten days, a month, or a year), and are called *erratics*, require the same treatment as the three primary types.

The type is subject to change: tertians and quartans become quotidians, and quotidians remittents; or they pass into continued fever.

The paroxysms of ague are sometimes *obscure* (*dumb ague*), or *incomplete*, or *inverted*; sometimes they are irregular or *erratic*, sometimes *partial*, or affecting only a portion of the body.

PERIOD OF INCUBATION.—From a few hours to several days, weeks, or months. Average duration, from ten days to a fortnight.

PATHOLOGY.—During the cold stage, the blood leaves the capillaries of the surface, and collects in the deep-seated parts; there is congestion in the head, chest, and abdomen; and the vascular spongy organs, especially the spleen and liver, are liable to suffer, and if the disease last for any length of time, become large and hard (ague-cake).

TERMINATIONS.—In chronic enlargement, with induration, softening, or suppuration of the liver and spleen; followed by ascites and anasarca; in fatal dysentery; in apoplexy; in fever of the remittent or continued type. In leucocythemia. (See p. 262.)

CAUSES. 1. *Predisposing*. Debility; intemperance; cold and moisture; middle age; male sex; a previous attack. 2. *Exciting*.—Marsh miasma, or the effluvia from decomposing vegetable matter. Also the effluvia from certain soils, impregnated with moisture, but *apparently* free from vegetable decomposition. The danger is greatly increased by exposure to these effluvia at night.

DIAGNOSIS.—Ague can only be confounded with hectic fever, and rigors, arising from some local cause, such as the passage of a gall-stone, the introduction of a catheter, or, more commonly, the formation of pus in some of the internal organs. In every doubtful case we must therefore search for a local cause.

PROGNOSIS.—*Favourable*. In cold and temperate climates. The paroxysms of short duration, regular in their recurrence, and the intermissions quite free from fever; the postponement of the paroxysms: the short previous duration of the malady; the quotidian and tertian types; an eruption on the lips.—*Unfavourable*. The disease of long standing; the paroxysms anticipating their usual time; being strongly marked, of long continuance, and attended with anxiety and delirium; a feverish state during the intermission; complication with other diseases; enlargement of the liver and spleen; the quartan type.

TREATMENT.—*In the Paroxysm*. During the *first* or *cold* stage.

The patient should be put into a warm bed, and warmth restored as promptly as possible by a hot brick or bottle to the feet, bags of hot bran or salt to the pit of the stomach, or a warm, hot-air, or vapour bath, aided by friction of the back and limbs, and the administration of warm tea, or weak wine and water.

During the *second*, or *hot* stage, cool air, cooling drinks, and sponging with tepid water.

During the *third* or *sweating* stage, the patient should be protected from cold draughts of air, and when the fit is over, he should wash in warm water, be thoroughly dried, return to bed, and be allowed to sleep; or be supplied with dry, warm clothing. The patient may now take a meal of nourishing food, and if much exhausted, a little warm brandy, or wine and water.

In the intermission. Some remedy which experience has shown to possess the power of preventing the return of the intermittent paroxysms should be administered: of these quinine and arsenic are the most efficient.

Cinchona bark, or its active principle *quinine*, and arsenic, are specific remedies in ague, and other intermittent disorders. Quinine is the more fitting remedy; it may be given in pill, or in mixture with excess of acid, in doses of five, ten, twenty, or even thirty grains daily.

Arsenic may be given in the form of liquor arsenicalis in doses of ♏v, gradually increased to ♏x or ♏xx, either alone or in combination with laudanum, every four hours during the period of intermission. Its effect must be carefully watched.

Previous to the administration of the specific remedy, the bowels should be freely opened by a brisk aperient (Form. 256).

The treatment of hemicrania, of brow-ague, and of those intermittent maladies known as masked ague, *e. g.* intermittent vomiting, diarrhœa, &c., is that of ague itself.

Remedies.—*In the paroxysm, or before it.* *Emetics*, given just before the fit, to prevent its occurrence, or during the cold stage, to hasten the approach of the hot fit. *Laudanum*, either alone or with æther (one drachm of each), may be given with great advantage, before the cold fit, or with more effect during the hot stage.

In the intermission.—Vegetable and mineral tonics (Form. 145) and an occasional cholagogue purgative (Form. 275).

Prophylaxis.—Avoidance of the air of early morning and evening, and of sleeping places near the ground. The choice of a dwelling on hilly ground, or in such a situation that the malaria may be intercepted by an intervening wood or broad surface of water. Warm and nourishing food before labour in malarious districts. Sailors should not sleep on land in such districts; and ships should be stationed at a distance of two or three miles from unhealthy coasts. Small doses of quinine two or three times a day. Thorough drainage.

Treatment of the Sequelæ of Ague.—Such as anæmia, and enlargement of the spleen and liver, and chronic dysentery, will be that recommended under these diseases.

FEBRIS REMITTENS—REMITTENT FEVER.

SYNONYMS.—Bilious remittent, remittent marsh, or paludal, fever.

DEFINITION.—A non-infectious fever with distinct exacerbations of variable duration and severity, but with no complete intermission.

SYMPTOMS.—The premonitory symptoms are those of ague, but the sensation of coldness is not so prominent a symptom. There is not always distinct rigor. The head symptoms are more severe; the countenance is flushed; and there is intense throbbing headache, and occasionally violent delirium. Tenderness of the epigastric and right hypochondriac regions, nausea, and bilious vomiting, with torpid bowels and scanty urine, are among the early symptoms. The alvine discharges are dark, often greenish, and very offensive; and there is considerable pyrexia and a dirty brownish tongue. The pulse is very variable in force and volume.

The fever subsides as the skin moistens and sweat appears; and thus a remission or moderation of the disease occurs. The patient remains in a state of mild fever, accompanied by giddiness and lassitude for about two hours, when the febrile symptoms recur, and slowly increase until they attain their former intensity, or exceed it. Paroxysms and remissions follow each other in regular succession for 7, 14, 21, or 28 days; at the end of either of which periods a profuse perspiration may terminate the attack.

In severe forms of the disease the paroxysms are more intense, the remissions shorter and less marked, the skin becomes yellow and pungent, the tongue covered with a slimy yellow mucus, the stools fœtid; the strength sinks, the pulse becomes thready, sordes form on the teeth, tendinous spasms are noticed, and stupor supervenes, passing into fatal coma. This more severe form is not distinguishable from yellow fever.

DURATION.—From five or six days, to four or five weeks. Usual duration about a fortnight.

CAUSES.—Those of intermittent fever. The disease is most common and severe in hot climates; in England it is rare, but this cannot be said of temperate latitudes generally.

DIAGNOSIS.—From continued fever by the recurrence of intervals or comparative freedom from febrile excitement.

PROGNOSIS.—*Favourable*, in proportion as the remissions are more distinct. *Unfavourable*, when the fever assumes the continued type, and in proportion to the suppression of the hepatic and renal secretions.

TREATMENT.—The worst forms must be treated in the manner recommended for yellow fever. As soon as the intermissions become well marked, the treatment for intermittent fever must be adopted. Quinine or arsenic may then be given, as in ague, during the remission.

SEQUELÆ.—Diarrhœa and dysentery.—Enlargement of the liver and spleen, and the anæmic state known as *leucocythæmia*. (See p. 262.)

DENGUE OR DANDY FEVER.

Under this and other names a febrile affection, "*sui generis*," has been described by several Indian physicians.

DEFINITION.—A remittent fever, characterised by severe arthritic pains and the eruption of an evanescent scarlet or morbilloïd rash or efflorescence, first upon the palms of the hands and rapidly spreading thence over the rest of the body.

SYMPTOMS.—Resemble those of a common cold, viz., lassitude, heaviness of the eyes, slight vertigo, a sensation of creeping cold down the back. Sometimes there are no premonitory symptoms, and the patient wakes out of sleep with great pain in the head, loins, and all the joints both small and large. Occasionally, the accession of the symptoms is so sudden that the individual is taken with arthritic pains and stiffness while walking in the street.

The hands in particular become stiff and swollen, the eyes watery, the conjunctivæ suffused, and the whole countenance bloated, swollen, and flushed. There is intense aching of the eyeballs, and they feel too large for their sockets. The pulse is full, strong, and about 100. The tongue is moist and coated, and the margins red or scarlet. The skin is dry and hot. There is nausea and anorexia and the bowels are usually confined. The pains shift rapidly from one joint to another, are excruciating, and there is great debility and restlessness.

Towards the end of 24 hours the headache and flushing of the face begin to decrease, and the pains lose their acuteness and assume a dull, aching character. Perspiration now appears, and there is great prostration of strength. Extreme languor continues during the whole period of remission. About the end of the third day the febrile symptoms return, and sometimes even with increased severity. The skin is hot and turgid, and red blotches like measles or scarlatina, often elevated and rough, appear upon the swollen hands and feet, and produce distressing tingling and itching. During the next 24 hours this efflorescence gradually spreads over the rest of the cutaneous surface and then dies away the following day, and is followed by desquamation.

The pains generally, but not always, begin now to subside, but the disease does not usually leave the patient until he has suffered a second or even a third relapse of fever.

DURATION and SEQUELÆ.—Relapses are often numerous, and the disease may continue for several weeks, and be attended with much debility and neuralgic pains of the joints. Cachexia, jaundice, with subacute hepatitis, hæmorrhoides, and neuralgia, are frequent consequences of this disease.

DISTRIBUTION.—This disease has prevailed epidemically in the West Indian Islands, and the southern parts of India.

CAUSE.—*Predisposing.* Heat, moisture, and stagnation of the air. *Exciting.* Derangement of the digestive organs.

PATHOLOGY.—Gastric and biliary derangement appear to be the conditions out of which the disease arises, and in its leading features it bears a strong resemblance to derangement of the digestive apparatus, which results in urticaria. The alvine dejections are of a dark-green colour, or even black, scanty and offensive.

PROGNOSIS.—Usually favourable. But the debility is sometimes so great during the remission as to result in sudden death.

TREATMENT.—At the onset, emetics, and free purgation by means of calomel and colocynth, followed by saline aperients. During the remission, quinine and the mineral acids.

FEBRIS ICTERODES—YELLOW FEVER.

SYNONYMS.—Typhus or synochus icterodes; Febris remittens gravior cum ictero; Bilious remittent of warm climates; Bulam fever; Mal de Siam; Vomito negro; Vomito prieto; Coup de Barre; &c.

DEFINITION.—A remittent fever accompanied by yellowness of the skin, and vomiting of a black or dark-brown fluid. (The disease assumes, in different epidemics, and often in the same epidemic, the several types of continued, remittent, and intermittent fever, and appears in every degree of severity, from simple ephemeral fever up to the worst forms of the disease. Yellowness of skin and black vomit are characteristics of the fever in its most marked form.)

SYMPTOMS.—The disease usually sets in with lassitude, listlessness, faintness, and giddiness, with frequent chills, acute pains in the back and limbs, pains in the head and eyeballs, a flushed face, an anxious expression of countenance, an injected, brilliant, and watery eye, and a hot, dry, and harsh skin. The mouth is clammy; the tongue generally white and moist, or watery, furred at the centre, and red at the tip and edges: and the patient is usually very thirsty. The pulse is increased in frequency, full, and hard; the respiration hurried, and interrupted by frequent sighs; there is great tenderness of the epigastrium, with extreme irritability of the stomach, and vomiting of the ingesta mixed with a glairy fluid. The bowels are confined, and the motions often clay-coloured. The urine is sometimes tinged with bile.

After these symptoms have continued, with increasing severity, from a few hours to three days or more, a marked remission takes place, and the symptoms, as well as the sensations of the patient, continue for several hours so much improved as to excite sanguine hopes of recovery. Sometimes the recovery of the patient dates from this remission, but more frequently the improvement is delusive. The febrile symptoms return, accompanied by increased debility; a small and frequent pulse; a cold and clammy skin; shrinking of the features; a dry tongue, covered with a brown or black fur; increased tenderness of the epigastrium, with an acrid burning sensation extending to the gullet, with extreme irritability of the stomach, and vomiting of all ingesta.

After a further interval of twenty-four or forty-eight hours, and sometimes earlier, the more characteristic symptoms appear: viz., jaundice; incessant hiccup, vomiting of inky-black fluid; a feeble, irregular pulse; accumulation of sordes upon the tongue and teeth; petechiæ; dark and gelatinous stools; hæmorrhage from the mouth, ears, nostrils, or bowels. In fatal cases, death may occur as early as the third or fourth day; it usually happens about the eleventh day, but occasionally still later.

Such is the usual course of this disease. But the symptoms and mode of termination vary greatly in different countries, in different epidemics, and even in the same epidemic. The following are some of the varieties:—*a.* Sudden coma and death in convulsions. *b.* Sudden seizure with black vomit, and death in a few hours. *c.* Intense pain and tenderness in the epigastrium, incessant vomiting, and death from exhaustion. *d.* Great anxiety and restlessness, with a clean tongue, and nearly natural pulse, followed after a time by black vomit and fatal exhaustion. Death may be sudden, the sequel of a quiet sleep, and it is sometimes preceded by acute pain and strong convulsions.

SEQUELÆ.—Organic diseases of the lungs, liver, spleen, or other internal viscera. Obstinate dysentery. Slow and tedious convalescence.

CAUSES.—*Predisposing.* A continued temperature of not less than 75° to 80° Fahr. The latter end of summer and beginning of autumn. The climate of the West Indies, of the south of Spain, of the seaports of intertropical America, of Mexico, and of parts of Africa. It occurs more or less frequently, and with greater or less severity, in the West Indian Islands, at the Havana, at Vera Cruz, at New Orleans, Mobile, Charleston, Baltimore, Philadelphia, and New York, at Gibraltar, and Barcelona. Male sex; intemperance; depressing passions; all the predisposing causes of common continued fever; especially imprudent exposure to night air. Recent arrival at the place where the disease exists. Want of protection by a previous attack. *Exciting.*—Marsh miasma, and decomposition of vegetable matter. The disease is most common in swamps at the mouth of rivers, in the low-lying parts of crowded cities, and in ships laden with vegetable produce, or kept in a damp and filthy state.

PERIOD OF INCUBATION.—Less than 10 days.

MORBID ANATOMY.—General yellowness of the skin, sometimes interspersed with blue or livid spots; the brain and its membranes generally healthy, and rarely presenting effusion of serum or blood; red, livid, or dark-black spots and patches on the mucous membrane of the stomach, and in its cavity with an inky black fluid (black vomit). The intestinal canal contains the same black fluid. The intestinal mucous membrane often shows patches of a brown or blackish colour, but no ulcers as in typhoid fever. The gullet is sometimes found inflamed and abraded; the liver is either greatly congested, or small and anæmic; the bladder is contracted and sometimes inflamed. In some epidemics blood has been effused into the structure of the muscles.

DIAGNOSIS.—In mild cases not easily distinguished from remittent and enteric fevers; but in severe cases, and in the more advanced stages, it is readily identified by the yellow skin and eye, and the black vomit.

PROGNOSIS.—*Favourable.* A regular and steady pulse; a soft and warm skin; a natural expression of countenance; a moist tongue; a free discharge of urine; a distinct remission; natural sleep of some hours' duration, undisturbed by vomiting; sudamina.—*Unfavourable.* Previous intemperance. Recent arrival on the spot where the disease is rife. The early occurrence of any of the characteristic symptoms, such as yellowness of the skin, especially if it be patchy, or the black vomit; pain in the back; tenderness in the epigastrium; acrid burning sensation in the stomach and œsophagus; incessant vomiting; deep sighing; singultus; great coldness of the surface, with a sensation of internal heat; and an irregular or intermittent pulse. Recovery may take place after the appearance of the most unfavourable symptoms, and, on the other hand, "it is known that in persons sitting up in bed amusing themselves, and apparently in a favourable state, the black vomit has suddenly appeared, quickly followed by death, to the utter astonishment of the medical attendants."—*Gillkrest.*

MORTALITY.—Very different in different epidemics. The deaths have amounted to 130 or 131 in 134; 19 in 20; 34 in 35; and 1,265 in 1,739; but they have been as few as 6,684 in 16,517; and even as 1 in 8. English regiments in Gibraltar have suffered a mortality of 1 in 11, and 3 in 11 of the numbers attacked; and in Bermuda of 1 in 3, and 4 in 11. The mortality is generally greatest when the epidemic is recent, and diminishes considerably in the course of time.

TREATMENT.—*Indications.* I. To unload the stomach and insure the free action of the bowels. II. To take advantage of any decided remission. III. To relieve existing symptoms.

I. The stomach should be unloaded at the very commencement by an emetic (Form. 220). The thorough evacuation of the whole of the intestinal canal during the first two hours of the fever cannot be too much insisted on, and purgatives should be freely exhibited until the bowels have acted five or six times.

At first we may give one, two, or three drops of croton oil, or an ounce of castor oil, or from ten to twenty grains of calomel, followed in two hours by a saline aperient. Many practitioners depend mainly upon mercury, given not only to unload the liver and intestines, but also to affect the constitution. After the first aperient dose a quarter of a grain combined with opium may be given every two hours, and mercurial ointment may be simultaneously rubbed into the groins and armpits.

II. Whenever there is a marked remission of symptoms, xx grs. of quinine should be administered at once, or two grains every hour.

III. When the *skin* is universally hot and dry, tepid sponging and the affusion of cold water to the head are of the greatest advantage. Where there is vigour of constitution, a sudorific action of the skin may be induced by packing the patient in a wet sheet. When, on the contrary, there is great coldness of surface, the warm bath, at 100° to 120° Fahr., and warm frictions, should be employed. *Local determination of blood* may be met by cautious local depletion or by counter-irritation. Bleeding from the arm may be resorted to at the outset of the disease in plethoric subjects, or where comatose symptoms are present. The *sickness* may be allayed by small quantities of arrowroot, or other demulcent fluids, effervescing draughts, ice or ice-water. The *pain in the eyeballs and forehead* may be relieved by cold to the head, the hair having been previously thinned, or the head shaved. *Hæmorrhages* require the use of the mineral acids with bitter infusions; or the acetate of lead in combination with opium (Form. 175) every two or three hours. *Collapse* must be treated by diffusible stimulants (Form. 6). Extreme *restlessness* in the advanced stages of the disease, and when great debility is present, may be met by opium in doses of one or two grains. The diet should at first be strictly antiphlogistic; but wine should be given as soon as the patient appears to require support.

During convalescence, quinine, in a tonic effusion, such as cusparia or serpentaria, should be given three or four times a day.

PROPHYLAXIS.—Temperance, cleanliness, regular exercise, and a residence, if possible, on a hill or rising ground. The *avoidance* of localities known to be unhealthy, of exposure to the heat of the sun, of impure water and stale food, and of the night air, particularly when yellow fever prevails. Persons of robust and plethoric habit, newly arrived at a place where yellow fever prevails, should carefully observe all the rules of health; keeping the bowels open by the regular use of gentle aperients. The sick should be separated from the healthy; and hospitals should be spacious, cleanly, and well ventilated. Europeans embarking for tropical climates should arrange to arrive at the healthy season of the year.

INFECTIOUS FEVERS.

GENERAL OBSERVATIONS ON INFECTIOUS FEVERS.

Apart from the exanthemata, modern observers have separated infectious fevers into three genera, viz., Typhus, Enteric, and Relapsing. These are collectively called "the continued fevers." The generic distinctness of relapsing fever was only established in the epidemic of 1843, and it was subsequent to this date that a similar distinction was recognized between typhus and enteric fevers.

Relapsing fever is an epidemic of rare occurrence. It appears in times of famine, and is not marked by any cutaneous eruption, by which, and by the abrupt cessation of the fever, and restoration to comparative health for a time, it is distinguished from typhus.

Typhus is essentially a "low" fever, being initiated by the most complete prostration, which increases as the disease advances, until the vital powers become reduced to the very lowest ebb. A characteristic rash and head symptoms sufficiently distinguish this fever. Gastric and intestinal symptoms, on the other hand, mark the access and progress of enteric fever, and indicate the severity of the disease.

Typhus, like relapsing fever, is the companion of squalor and want. It is supposed to occur in epidemics, but we have reason to believe that it exists *continuously* to some extent and degree. Of these fevers, typhus is the most infectious; enteric the least so. The mortality in typhus and enteric is pretty equal. That of relapsing fever is comparatively small.

TYPHUS—EPIDEMIC CONTINUED FEVER.

SYNONYMS.—From its prevailing character—PUTRID, PESTILENT, MALIGNANT, EPIDEMIC, ATAXIC, ASTHENIC, or ADYNAMIC FEVER: After a leading symptom of the disease—BRAIN FEVER: After its most common external character—ERUPTIVE, PETECHIAL, MACULATED, or SPOTTED FEVER: After its presumed cause—CONTAGIOUS, INFECTIOUS: and when named after the places in which it most commonly prevails—PRISON, GAOL, CAMP, SHIP, and HOSPITAL FEVERS, and PARISH INFECTION.

DEFINITION.—A continued fever of fourteen or twenty-one days' duration, accompanied by extreme prostration of strength, great disturbance of all the bodily and mental functions, and a strong tendency to cerebral complications; and characterised, in most instances, at an early period of the fever, by a peculiar eruption on the skin.

SYMPTOMS.—The onset of continued fever is either sudden and well marked, or gradual and obscure.

In the first case, the disease is generally ushered in by a succession of severe shivering fits, followed by acute pain in the head, aching in the back and limbs, lassitude and weariness, an unsteady gait, and a disinclination to exertion of mind or body. The surface is cold and pale, the skin contracted, and the pulse either small and weak, or full, quick, and very compressible. The breathing is quickened, and often interrupted by deep sighs. The countenance wears a dull, anxious, and confused expression, and sometimes closely resembles that of a person in a state of intoxication. The appetite fails: in some cases there is nausea; the bowels are generally confined, and the tongue is coated with a dirty-white fur; the pulse is feeble and fast, but rarely exceeds 120.

In the second case, the symptoms are often so obscure that it is not easy to determine whether the patient is suffering from continued fever, from slight indigestion, or from a common cold. He has no well-marked rigors, no severe pains in the head, back, or limbs; but he is pale, languid, weary, and drowsy, and complains of dull headache; is disinclined to exertion, and incapable of applying himself to business. His appetite fails; the tongue is covered with a thin white fur, the bowels are constipated, the pulse somewhat increased in frequency; and he passes restless nights, and wakes unrefreshed. This period of uncertainty may last three or four days; and the transition into a state of undoubted fever be so gradual that it may be impossible to fix on any precise time at which the disease may be said to have been first present. The history of the case, by revealing the fact of an exposure to the contagion of fever, is often the best aid to a correct diagnosis.

This premonitory stage, whether the onset be sudden or gradual, passes more or less rapidly into fully-developed continued fever, marked by pungent heat of skin, frequent pulse, thirst, headache, throbbing of the temples, flushing of the face, suffusion of the eyes, and great restlessness and irritability. The countenance is dusky, and expresses indifference and confusion of mind. Questions are answered slowly, and as if with difficulty, but rationally. The patient grows weaker, and about the *fourth day* is in bed, lying on his back, and unable to rise without assistance. If he gets any sleep it is disturbed by dreams; he mutters, and often starts, and wakes unrefreshed; but in some cases there is great drowsiness; in others a total absence of sleep. The tongue, which is at first coated with a moist dirty-white fur, or marked with a dry brown streak along, or on each side of, the middle line, becomes uniformly covered with a dry brown coat. The urine is scanty and high-coloured, and is apt to accumulate in the bladder.

About the fifth day, but varying from the fourth to the seventh, a diffused rubeoloid rash makes its appearance on the trunk of the body, being usually best developed on the chest and front of the shoulders, occasionally on the backs of the hands, but rarely on the face. In some cases and in some epidemics the rash is very faint, and the dusky skin is slightly freckled with a light brownish maculation. In other cases and in other epidemics the skin is thickly speckled and blotched with dusky purple petechial spots. Between these two extremes there is every degree of intensity. When moderately developed the rash bears a strong resemblance to that of measles, but it has a duskier tint. The spots are scarcely elevated above the surface; their form is irregular; they have no defined limit, but faint away into the duskiness of the surrounding skin. At first they have a florid venous tint, and disappear on pressure; but when they are a day or two old they cease to be prominent, become paler, and of a dirty-brown colour, and no longer disappear on pressure. When the number is limited the spots are isolated and scattered; but when the rash is very copious the spots are loosely aggregated into irregular patches. About the *seventh day* delirium begins to attend the waking hours, and the patient mutters constantly and incoherently, or talks loudly and wildly; and at this period there may be some difficulty in restraining the patient, though usually he is not strong enough to get out of bed. The head is intensely hot, and the face and neck suffused with a vivid coppery blush. Still the patient may be roused, and will open his mouth and fruitlessly attempt to protrude the parched brown tongue, which, as well as the teeth, are blackened with sordes. The breath and cutaneous exhalation have a peculiar rank cadaverous odour; the former contains free ammonia. The pulse ranges from 90 to 120, and varies in volume; is always wanting in strength, being soft and compressible. Stupor now begins to alternate with delirium, and the patient lapses into a state of apathy.

He is deaf; his expression is vacant; the eyes filmy; the mouth open; deglutition begins to fail; the hands are tremulous and convulsed, constantly grasping at objects in the air, or picking the bed-clothes. This critical condition may continue for twenty-four hours or more, and then the patient may begin to rally. If no improvement take place, he sinks into complete coma, congestion of the lungs very commonly supervenes, and the patient dies suffocated. The crisis occurs about the *fourteenth day;* and if favourable, the patient falls into a sound sleep, the skin regains its warmth, the pulse falls, and increases in force, the skin and tongue begin to moisten, the patient regains consciousness, a gentle perspiration sets in, the alvine and urinary secretions become more abundant, the tongue rapidly cleans, and with this improvement in the symptoms there is a craving for food. The pulse may fall to 60 or even 40. If, on the other hand, there is no amendment, the skin soon becomes cold and clammy, and the toes and fingers cold and blue, the pulse becomes more frequent, thready, and occasionally imperceptible, the power of deglutition is lost; the patient lingers on awhile, and then dies insensible.

CONCOMITANT AFFECTIONS.—NERVOUS SYSTEM.—The brain is very soon affected in typhus, persistent *headache* being among the symptoms manifested during the first week. There is a heavy dull pain, accompanied by vertigo, and by moans or cries. Towards the end of the week it decreases, and delirium takes its place. This is sometimes slight, being an incoherent muttering (typhomania); in other cases it is so violent as to be mistaken for acute mania; and the patient, if not narrowly watched and restrained, will sometimes effect his escape from his attendants, and throw himself out of window, or place himself in circumstances of great danger. Between these two extremes there is every degree of intensity, proportioned to the vital power of the patient, acute delirium being more common in the young and robust than in the aged and feeble. *Wakefulness* is present in most cases, and if we do not promote sleep, it may be continuously absent for 50 hours or longer. *Somnolency*, *stupor*, *apathy*, and *coma* come on in succession as the disease increases in severity; at the same time the *special senses* become much blunted, as is well seen in the deafness which invariably accompanies the disease. *General convulsions* are rare, appearing occasionally towards the close of the disease; and often indicating suppression of urine. A fatal termination may be expected when such grave symptoms arise.

MUSCULAR SYSTEM.—*Prostration* and a painful sense of weariness are among the premonitory symptoms; and *general muscular pains*, simulating acute rheumatism and of considerable intensity, are sometimes present in the early stage. They are apt to mislead us in our diagnosis. Later in the disease *paralysis* affects the sphincters of the bladder and rectum, the evacuations are passed in bed, and the urine dribbles away from an over-distended bladder. The muscles of mastication, deglutition, and vocalization are similarly affected; the tremulous tongue cannot be protruded, food or fluids are swallowed slowly and with difficulty, the voice becomes feeble and the speech inarticulate. *Muscular tremor* is invariably present, and sometimes *tonic spasm* affects some group of muscles.

Respiratory System.—Pulmonary complications are very common. *Bronchitis* occurs to some extent in almost every case. *Pneumonic* and *Hypostatic congestions* are also very common, the former occurring in the earlier stages, the latter towards the crisis. They are indicated by urgent breathing, and lividity of the lips and face. Pain is rarely complained of, and the cough and expectoration are not in proportion to the pulmonary disease. Quick breathing, a little wheezing with a slight cough, and occasional expectoration of colourless, frothy, or russet and viscid sputum, are sufficient indications of pulmonary mischief, and, on examining the chest, we may detect pretty general mucous rhonchus and crepitation. Crepitation is commonly to be heard at the back of the chest. Congestion is indicated by dulness and bronchophony. *Pleurisy* occasionally supervenes in a still more insidious manner, the effusion being fluid in most cases; in others, acute pain and the usual physical symptoms of the disease are present.

Glandular System.—1. *Affections of the Liver.*—Jaundice is a very rare complication. 2. *Inflammations of the parotid, axillary, and cervical glands*, rapidly running on to suppuration, are amongst the most severe complications. These affections often appear about the time of convalescence, and either prevent or greatly retard it, for the adjacent integument becomes indurated, and the sloughy cellular tissue surrounding the glands separates very slowly. Buboes in the arm-pits and groins, and carbuncles, are of rare occurrence. *Phlegmasia dolens* is also a rare sequel. 3. *Affections of the Kidneys.*—In typhus the quantity of urine is diminished, colour reddish-brown, specific gravity high; the quantity of urea is considerably increased, and uric acid is also increased. The chlorides gradually diminish, and are at last reduced to a mere trace. Dr. Buchanan gave a patient 1½ ounces of chloride of sodium, but not a trace could be detected in the urine afterwards. Albumen is found in about half the cases; it commonly appears after the seventh day of the disease. Occasionally, *suppression of urine* occurs, and the patient dies comatose, with or without convulsions.

The Skin and Integument.—1. *Boils* sometimes appear during convalescence. 2. *Erysipelas* is apt to occur when prevalent. 4. *Gangrene* and *sloughing* of the integuments, preceded by erythema of the skin, are common occurrences in the advanced stage of the disease, in parts liable to pressure. Large bed-sores are often formed over the sacrum and trochanters.

Stages. — 1. *Period of Incubation* about ten days. 2. *The stage of invasion*, extending from the commencement of the illness, to the appearance of the rash, from four to seven days. 3. *The stage of nervous irritation*, restlessness, wakefulness, and delirium, extends from the end of the last stage till somnolency comes on, a period of three or four days. 4. *The typhous stage.* This is the last stage of many other diseases, as well as of typhus, and is commonly called the "typhoid" stage. We abandon this term because it designates a particular fever, and use the word typhous in its place. The typhous stage is characterised by dorsal decubitus—a rapid thready pulse; muttering delirium, stupor, or imperfect coma; a dull fixed eye; an open mouth displaying a hard, dry, and brown tongue, with sordid lips and teeth, and exhaling an offensive odour. The evacuations are passed involuntarily, and the hands are convulsed. 5. *The convalescent stage.* A month is usually sufficient to restore the patient to health; falling of the hair is common, but there is no permanent derangement of the functions.

DURATION.—Convalescence mostly commences on the fourteenth day, but in mild cases about the end of the first week. It is occasionally postponed to the twenty-first day.

PROGNOSIS.—*Favourable,* if the patient be young, well nourished, and of a non-excitable temperament, if the pulse maintain moderate bulk, and do not exceed 120, and there be no tendency to pulmonary complication. *Unfavourable,* if the patient be beyond sixty, and feeble, if the pulse be weak and intermittent, or if it much exceed 120, if the rash rapidly become petechial, if pulmonary complications appear early.

MORTALITY.—Out of 4,787 admissions into the London Fever Hospital, 1000 = 20·89 per cent. = 1 in 4·78 died. Deducting those cases which were fatal 24 hours after admission, the mortality falls to 19·56 per cent. It is greater in males than in females.

PATHOLOGY.—*The blood* is very dark and fluid; and if we meet with coagula, they are soft and friable. If pneumonia have existed, firm yellowish clots are found in the right side of the heart. Taken during life the blood is found to be deficient in fibrine; urea may often be detected in the serum, and ammonia is present in appreciable quantity. *The Bile* is dark and thick, like treacle. I have observed its specific gravity as high as 1050. With water, it forms a golden-yellow feebly alkaline solution, which possesses the reactions of healthy bile. On evaporation it yields a large quantity of glistening and brittle black residue, smelling strongly of fatty matter. *The Muscles,* including the *heart,* are dark and easily lacerated. *The Brain and nerve tissue* are firm and healthy, but the cerebral membranes are commonly gorged with blood. Passive effusion of serum tainted with urea between the membranes and into the ventricles is one of the usual results of typhus; inflammatory exsudations, such as jelly-like serum beneath the arachnoid, a few small patches of coagulated fibrine on the upper surface of the pia mater, and shreds of coagulated lymph in the lateral ventricles, are rare. The *kidneys* are often found greatly congested. The *alimentary canal* is everywhere healthy, or only congested in its most vascular portions. The *liver and spleen* are more or less congested and softened. *Effusions* into the serous cavities are common. The *respiratory organs* show various lesions. The mucous membrane of the respiratory tract is injected and soft; the lungs may be œdematous, engorged, or partly consolidated. The air-tubes are commonly filled with frothy fluid.

GEOGRAPHICAL DISTRIBUTION.—Typhus is common to every country of Europe, and is therefore so far independent of climate. Italy, Spain, and Great Britain appear to have suffered most from its ravages; and Ireland has been so little free from it that it would appear to be endemic there. It is prevalent in Canada and the United States. We have no evidence of its existing in Australia and New Zealand. Of its existence in South America, in Asia, and in Africa, we want positive proof, fevers of all kinds having been much confused in these parts of the globe. Many have thought that the plague is the typhus of tropical countries.

CAUSES.—1. *Predisposing: Depression of the vital power* from mental or bodily exhaustion; hence the disease most commonly attacks those of adult age. *Season and Temperature:* Typhus appears to prevail, cæteris paribus, irrespective of these conditions. *Overcrowding with imperfect ventilation* and *insufficiency of food* are both very powerful predisposing causes. Even in London, typhus is rare among the middle and upper classes. The severest epidemics have appeared in times of scarcity.

2. *Exciting: The infection of a specific poison* generated within the bodies of persons suffering from prolonged want of sufficient food, and exposed to animal exhalations. No other fever is so infectious as typhus. It spreads quickly through a family: nurses and medical attendants, if they do not use sufficient precaution, invariably take it. The poison is contained in the cutaneous and pulmonary exhalations of the patient, and is no doubt introduced into the system of other persons through the lungs.

DIAGNOSIS.—Extreme muscular prostration, with general dull aching pains, a weak pulse, dusky complexion, dulness of the senses and intellect, heavy persistent headache, a peculiar dusky eruption, and a bad odour of the body, are the marks of typhus. Excepting the rash, however, which does not appear until the fourth or fifth day, these are not very conclusive symptoms; and there may be much doubt as to the true nature of the disease during its early stages, when it may be confused with enteric and relapsing fevers, measles, phrenitis, suppression of urine, and with such diseases as pneumonia and pyæmia, when they assume the typhous condition.

Enteric and relapsing fevers are distinguished at pp. 300, 305. *Rubeola*, coryza, and catarrh distinguish this disease, and the rash is peculiarly patchy, and of a much brighter colour than in typhus. *Phrenitis* is ushered in by great irritability of temper; the senses are painfully acute, so that light and sound are intolerable, and the eyes are bright and wild. Strabismus is a common symptom: there is often sympathetic vomiting; there is no rash. If *meningitis* be present, we have superadded to the symptoms of phrenitis those of acute mania, with intolerable pain in the head.

Low forms of inflammation of the brain are distinguished with great difficulty. The history of the case, and the absence of much fever and rash, will serve to guide us. *Uræmia* is characterised by the sudden accession of stupor, rapidly passing into coma. Convulsions, which are rare in typhus, are generally present in this disease. *Pneumonia.*—General pneumonic engorgement of asthenic form is still more difficult to distinguish from typhus; indeed, the typhus poison, in common with other animal poisons, often produces rapid engorgement of the lungs and depression of the vital power, and death occurs in such cases before specific symptoms of the fever have had time to declare themselves.

PROPHYLAXIS AND DISINFECTION.—Avoid the exhalations from the patient; dilute and carry them away by direct and free ventilation; distribute about the room lumps of wood charcoal; expose all articles of clothing infected with the disease to the action of boiling water, or to steam, and subsequently rinse them in water holding carbolic acid in solution. Mattresses should be well baked in an oven, and the feathers of feather-beds should be submitted to a process of purification.

TREATMENT.—The patient should be placed in a cool, well-ventilated room, in which a brisk fire is constantly burning, with a nurse in constant attendance. If the skin be pungently hot, the patient should be immersed for five minutes in a hot bath; if there is less heat of skin, tepid sponging will suffice.

The heat of the head may be allayed by iced water, poured in a small continuous stream from a height for the space of ten or fifteen minutes. The head should be shaved whenever the brain symptoms are severe, and if the headache be not relieved by the cold douche, blisters should be freely applied to the forehead, or to the whole of the scalp. The bowels should be kept in free action by the help of cholagogue purgatives. Sleeplessness, nervous excitement, and delirium must be combated by hypnotics. Opium is the remedy: it should be given in moderate doses at first, such as fifteen drops of tincture, or five grains of compound soap pill; but if this fail to fulfil the object the dose may be doubled or trebled.

But the indication for treatment of all others is to support the failing strength. The constant attention of good nursing is indispensable; the means are diet and medicine. In the early stages food is generally taken well, but the digestive organs are not in a state to dissolve solid food. The diet should consist of eggs, milk, beef-tea; three or four eggs may be given daily: they should be given with tea or coffee in the form of emulsion. Alcoholic stimulants are invaluable in typhus, and may be administered throughout the disease. In their exhibition we must be guided by the state of the pulse. If the pulse be of fair volume and under 110, little or no alcohol will be needed. If it be failing, and the patient cannot take much food, we may give from ℥vj. to ℥xvj. of brandy or an equivalent quantity of wine in the twenty-four hours. Brandy is the best kind of stimulant; it may be given quite irrespective of delirium; it should be mixed with water or milk, and given every one or two hours.

Of medicinal stimulants ammonia is the best. (See Forms. 1, 6.)

Quinine and acid is not always well assimilated during the height of the fever, but after the crisis it is a very useful combination.

Strict attention must be paid to the state of the bladder, especially in the later stages of the disease, when the patient becomes apathetic and the muscular tissues fail in contractile power. If the urine accumulate in the bladder, it must be drawn off twice a day. If the quantity be much diminished we must resort to brisk hydragogue purgatives, and apply mustard poultices to the loins.

We must carefully examine, from day to day, the state of the integuments over the sacrum and trochanters: and as often ascertain the temperature of the feet. Bedsores and mortification of the toes are grave complications which, in nineteen cases out of twenty, may be prevented by proper vigilance on the part of the medical attendant.

The breathing must be carefully noticed. If the inspirations exceed twenty-five per minute, we must examine the chest. If pleuritis or pneumonia be present, blisters will be necessary. If there be cough and wheezing, with hurried breathing and mucous crepitation in the lungs, mustard poultices and turpentine stupes may be advantageously applied to the chest, and expectorant stimulants (Form. 235) administered.

If inflammatory swelling of the parotid arise, we must endeavour to prevent suppuration by the usual means. Half-a-dozen leeches may be applied. As this is a complication which supervenes about the time of convalescence, we may generally exhibit iron and quinine freely. The quantity of alcoholic stimulant should at the same time be increased, and the diet should be as full and nutritious as possible. As soon as fluctuation is detected, the pus should be let out by free incision.

CEREBRO-SPINAL FEVER.

Under the terms, Epidemic Cerebro-spinal Meningitis, Purpuric Fever, &c., a variety of typhus in which spinal symptoms are prominent has been described. The early symptoms are those of typhus, with more severe myalgia than usual. Pain in the muscles of the neck is especially complained of; and the body generally, but more especially the spine and abdomen, is affected with acute neuralgic pains. The delirium and stupor are always great; the head is stiffly retracted and the muscles generally are in a state of tetanoid rigidity or spasm. As the patient lies a little over to one side, the body is often stiffly arched backwards; sometimes an arm is constantly retracted; sometimes the legs are rigidly flexed upon the thighs; occasionally the muscles of the face and eyeballs are implicated, as indicated by trismus, fixed risus, or strabismus. In the larger number of cases, a cutaneous petechial rash appears very early, and the petechiæ often enlarge to form large blackish blotches, which may become raised, vesicular, and sometimes gangrenous. In some outbreaks herpetic eruptions are common.

At first there is hyperæsthesia, but the patient soon lapses into a comatose state, and usually dies between the first and the eighth days. The progress of the disease is sometimes so rapid that the usual premonitory symptoms are absent, and the patient falls into a state of collapse, rapidly passing into coma, purpuric blotches appearing simultaneously.

After death, great vascularity of the pia mater of the brain and spinal cord, with more or less clear or milky serum effused into its meshes, will be discovered.

Examples of this variety of fever occur every now and then during the progress of typhus. Epidemics have been particularly noticed in the United States, on the banks of the lower Vistula, and in Ireland. The treatment is that of ordinary typhus, with especial regard to the cerebro-spinal symptoms. The shaved scalp should be blistered, and a long narrow strip of blistering plaster placed over the upper half of the spine.

ENTERIC FEVER.

SYNONYMS.—Typhoid, pythogenic, gastric, intestinal, bilious continued, and cesspool fevers; muco-enteritis.

DEFINITION.—An endemic contagious fever, generated by the ingestion of decomposing animal matter.

SYMPTOMS.—The onset of the disease is generally very insidious: There are no marked premonitory symptoms: chilliness, loss of appetite, and slight pyrexia—sometimes accompanied by nausea and a little diarrhœa, and sometimes not—mark the outset of the disease in most cases. In others, vomiting and diarrhœa, with some abdominal tenderness, are the earliest indications. On careful examination some evidence of gastro-intestinal irritation will always be found. The tongue is furred and red at the tip and edges; the pulse is small, frequent, and sharp; the face is pale and somewhat pinched; but the cheeks have a circumscribed blush. Tenderness will generally be complained of on pressing the abdomen. The patient becomes weak, the skin is hot and dry, the lips cracked. There is complete anorexia and much thirst. In this condition the patient generally comes, for the first time, under the notice of the medical practitioner, and states that he has been feeling unwell for about a week. On the *seventh day*, or a little later, a few round, well-defined rose-coloured spots make their appearance on the abdomen, chest, and back of the patient. These spots somewhat resemble the papulæ of variola during the first few hours of their existence, but they are not so large or so hard. They are elevated and prominent, and disappear on pressure. In at least one half of the cases, and in the worst form of the disease, they are altogether absent. When present, the number varies considerably: in most cases they are very few, and may easily be overlooked. At this stage of the disease we shall rarely observe more than half a dozen over the whole of the chest and abdomen, and very often not more than three. The quantity of the rash bears no proportion to the severity of the disease. Forty-eight hours after their appearance the spots begin to fade and new ones arise, which in like manner disappear, and are succeeded by another crop. The abdomen now will usually be found more or less tympanitic and tender, the tenderest part being the right iliac fossa, where pressure commonly produces gurgling. If the bowels have not yet been relaxed, diarrhœa usually sets in now with greater or less severity. The stools are watery, and of a light yellow colour; the tongue is covered with dirty-white fur, and is cracked and aphthous. If the purging continue, it becomes dry, brown, and contracted, or red and glazed; it is usually more or less fissured, and it is often covered with large patches of superficial ulceration. The teeth are crusted with sordes; the pulse ranges between 90 and 120; the skin and head are hot, and there may be much delirium; the cheeks wear a hectic blush. During the second week of the disease, and afterwards, hæmorrhage from the bowels may occur. The patient may become suddenly blanched and die without the discharge of blood per anum, and in such a case the intestines will be found distended with blood. In other cases the hæmorrhage recurs at intervals, and the patient becomes pallid and much prostrated. Hæmorrhage, however, is not the only danger we have to anticipate. The patient is often cut off by perforation of the intestine. This dreaded result may be expected if the purging be frequent and persistent, if the tenderness and tympanites increase, and if vomiting and hiccough supervene. Perforation is most commonly preceded by symptoms of general peritonitis, accompanied by excessive tympanites and persistent hiccough and vomiting. A paroxysm of more intense abdominal pain may indicate that perforation has taken place, or previous to such a complication the patient may sink and die.

The patient may be conscious and acutely sensible of his condition throughout the disease to within an hour or two of his death; but when the diarrhœa is very exhausting and protracted he usually falls into a state of apathy, with a little delirium at night. He lies motionless in bed, and is now liable to bedsores. Emaciation occurs very rapidly, and if no amendment takes place the typhous condition becomes established: the tongue and teeth are blackened with sordes; stupor, with convulsive twitchings, delirium, and coma, succeed each other; the watery motions are passed involuntarily, and the patient gradually sinks.

In favourable cases the improvement is generally very slow. The number of stools gradually diminishes, and they become more and more solid; no fresh spots appear; the temperature of the skin falls, and perspiration appears; the tongue begins to clean, and the appetite quickly returns.

Such are the usual symptoms; but they are subject to considerable variation. Profuse diarrhœa, with vomiting, may be amongst the earliest symptoms. In some cases the bowels are constipated throughout. In the very mildest cases the worst complications may at any time supervene. There may be noisy delirium from the commencement of the disease.

Convalescence is in some cases interrupted by a relapse, generally traceable to some error of diet; a crop of fresh spots appear, and diarrhœa again sets in, to be followed perhaps by more urgent symptoms.

The average duration is above four weeks: it is rarely terminated in three weeks. If the attack have been severe, convalescence will be very much protracted, and the patient will not be safe for many weeks.

COMPLICATIONS AND SEQUELÆ.—Diseases of the respiratory organs

—bronchitis, pleurisy, and pneumonia—are frequent complications of enteric fever. *Laryngitis*, with croupous exsudations, and ulceration, is not uncommon. Impending suffocation is sometimes relieved by the ejection of fragments of a tough membrane. In such a case aphonia may result, and continue for several weeks. *Abortion* and *phlegmasia dolens* are liable to occur during an attack of enteric fever. *Peritonitis, perforation,* and *hæmorrhage* occur as natural results of the progress of the disease. If the ulcers of the intestine erode a small artery, more or less hæmorrhage occurs. If the progress of the ulceration be not checked, the ulcers extend through the mucous, areolar, and muscular coats, and reach the peritoneal covering, and excite inflammation, which rapidly spreads and becomes general. *Perforation* is rarer than is generally supposed. The deepest part of the ulcer often, indeed, lies on the attenuated peritoneum, which here and there presents a slough, pretty firmly adherent, and retained in its position by solid effusion on the intensely-inflamed serous surface. When perforation occurs, the peritoneal coat becomes excessively thin, and gives way in one or more places. The apertures are generally small and rounded. *Inflammation and suppuration of the parotid* sometimes occurs, but more rarely than in typhus. *Marasmus* is almost a necessary result of a severe form of the disease, since the mesenteric glands, as well as the solitary and agminated glands of the intestine, are so directly and extensively involved.

PATHOLOGY.—Whatever be the ultimate cause of enteric fever it essentially manifests itself in derangement of function, and in lesion of structure of the alimentary canal. The lips are cracked; the tongue fissured, and often covered with ragged aphthous ulcers; and the pharynx and œsophagus occasionally present the same lesions if the disease be protracted beyond the third week. The stomach and duodenum, however, are unaffected, and the disease chiefly, in many cases exclusively, attacks the lower part of the small and the large intestines. But it is upon the solitary and agminated glands (Peyer's patches) of the *lower third of the ileum* that the disease expends its virulence. There we invariably find disease after death from enteric fever. In the early stage of the disease (on the fifth or sixth day) these normally obscure glands are swollen and distinctly elevated above the surrounding mucous membrane; at the same time they become vascular; the blood-vessels of the surrounding mucous membrane are seen converging towards their centres; and the corresponding part of the peritoneum presents a patch of dilated vessels. The enlargement and vascularity increase, and the swollen gland becomes soft and abraded; and this first stage of degeneration is quickly succeeded by sloughing or ulceration. Sometimes a whole Peyer's patch is covered with a discoloured, ashy-looking slough. When the slough has separated, or the ulcer advanced, the surface exhibits a rugged appearance, being formed of angry-looking granulations, of various sizes, enclosed in an irregular network of sloughy areolar tissue. The edges of the ulcer are hard and elevated; externally they are rounded and smooth, internally they are ragged with excavations. In proportion as the base of the ulcer nears the peritoneum, so does that membrane increase in inflammation; and if the ulcers be numerous the inflamed patches become confluent, and the outer surface presents the appearance of intense inflammation, and may be covered with plastic lymph. As soon as ulceration extends to this covering, perforation impends. The event, however, is often retarded for a time by the adhesion of the part to a contiguous coil of intestine; or by the deposition of solid lymph upon its outer surface. The aperture formed in the peritoneum rarely exceeds three lines.

The ulcers are in proportion to the number of the glands, or size of the patch affected: if a single gland, or only two or three, the ulcer is a small spot; if a Peyer's patch, then there will be a rounded or oval ulcer, varying in size from a quarter of an inch to an inch and a half. The ulcers are sometimes confluent.

On recovery from the attack the ulcers heal, cicatrize, contract, and ultimately form a smooth, depressed surface, thinner and less vascular than the surrounding healthy coat.

When the *large intestine* is implicated, the disease is usually confined to the cæcum and the ascending colon. The cæcum is often severely affected. The ulcers in this part of the alimentary canal are small, round, and uniform in size, unless they become confluent.

The mesenteric glands show their sympathy, if not their identity in anatomical structure and function, with the solitary and agminated glands, in becoming inflamed and swollen to several times their natural size. The inflammation may go on to suppuration.

The spleen is enlarged and softened and congested.

The liver speedily becomes fatty and enlarged. The mucous membrane of the *gall-bladder* is frequently found inflamed, but rarely ulcerated.

The bile is thin and almost colourless, commonly acid, and of low specific gravity, and yields a very small proportion of solid matter.

GEOGRAPHICAL DISTRIBUTION.—Enteric fever prevails generally over all the world.

CAUSES.—1. Predisposing. *Youth.*—The mean age of 1772 cases admitted into the London Fever Hospital during ten years was 21. Of these half were between 15 and 25, one-fifth were under 15, less than one-seventh were above 30, and less than one-sixtieth exceeded 50.

Season.—Enteric fever is an autumnal disease; though it may and does prevail during winter, spring, and summer. It is more prevalent in dry and hot than in cold and wet seasons.

2. Exciting.—*Exhalations from putrid decay of animal matter.* The following instances which are advanced to establish this point are cited in Dr. Murchison's work on the Continued Fevers of Great Britain. I. Twenty out of twenty-two boys, at a certain school, were seized with fever, accompanied by symptoms of severe gastro-intestinal irritation. Two of the fatal cases were examined, and the usual lesions of Peyer's patches, and the solitary and mesenteric glands, were discovered. The cause was attributed to the opening, two days before the first case of ill-

ness, of a drain at the back of the house, which had been choked up for many years, and the distribution of its offensive contents over a garden adjoining the boys' playground.

II. In the year 1838 an epidemic of enteric fever desolated a commune in the department of Ariège. Nearly half the inhabitants were attacked, and nearly a third of these died. The cause of the epidemic was traced to a stagnant pool, the receptacle of dead animals and of all the sewage of the district. Three times the pestilence returned, and each time when the wind was blowing over the infected water.

In these cases it is assumed that the poison was conveyed by the air. In the following case it appears to have been introduced into the system by water:—

III. The inhabitants of thirteen out of thirty-four houses of a certain crescent derived their drinking water from a well at one end of it; the remainder were supplied with water from another source. At the end of September it was evident that the water from the pump was tainted with sewage. Early in October intestinal fever broke out almost simultaneously in all the thirteen houses using the water.

Some observers, however, attribute the disease to a *specific poison*, contained in the alvine excretions of persons suffering from the disease, and deny that it may be spontaneously generated by putrid animal matter. Observed facts and the few experiments which have been made tend, however, to disprove these views.

Contagion and Infection.—Much doubt prevails whether enteric fever be infectious or not; and the question really turns upon the existence of a distinct specific poison. Positive proof that it may be conveyed from one person to another is wanting, and certainly the majority of people affected with the disease derive it, upon the clearest evidence, directly from one and the same source. Those in attendance upon persons suffering from enteric fever do sometimes fall ill of the disease, but the source of the disease may be present in any house.

DIAGNOSIS.—In the early stage, enteric fever may be mistaken for *typhus*, *relapsing fever*, and *variola*. The difference between typhus and enteric fever have reference—1. To the general phenomena of the two diseases. Great muscular prostration and early cerebral disturbance, with dulness of the senses and mental faculties, mark the onset of typhus; while symptoms, more or less obscure, of gastro-intestinal disturbance indicate the presence of enteric fever; but sickness and diarrhœa may be absent in enteric fever, and head symptoms may be prominent from the first in this disease. 2. *Abdominal tenderness* about the umbilicus and right iliac fossa, and, 3. *A moist thickly-furred aphthous tongue*, may inform us that the disease is enteric, and not typhus fever. 4. Light ochre-coloured fluid stools are diagnostic of enteric fever. 5. When the eruption appears the diagnosis becomes certain. In typhus the rash appears about the fourth day; in enteric not before the seventh. In typhus it consists of a diffused dusky mottling composed of irregular, uncircumscribed non- or barely elevated spots, tending to fade into dirty discoloration, or to become distinct petechiæ. In enteric fever the rash appears much later, never gives a mottled appearance to the skin, and is never confluent. The constituent spots are rose-coloured, circumscribed, isolated, and elevated, so as to be distinctly felt by the finger; they always disappear on pressure and never become petechial. The only difficulty in diagnosis by the skin is that the freckled or mottled skin often seen in dark complexions, or when certain faint syphilitic maculæ are present, may so mislead us that we may fail to observe the three or four minute pink papulæ which indicate the presence of enteric fever. 6. *The progress and duration of the disease.*—The dusky blush suffusing the head and neck in typhus, contrasts with the circumscribed hectic flush and pinched features of enteric fever. The one disease tends to death by coma, the other to death by asthenia; typhus kills or shows signs of departure in the second week, enteric fever continues for three or four weeks.

Variola.—If the lumbar pain be absent in the accession of this disease, and the eruption make its first appearance as a few isolated papules upon the chest and abdomen, the case may be doubtful for a day. For example, a patient has been feeling poorly for a week before he is seen, and then he is in a state of high fever, complaining of headache and great and persistent nausea, but there is no vomiting nor lumbar pain; he presents a large but faint vaccine scar; the tongue is coated with a dirty-white fur, the abdomen painful on pressure, and there is a distinct gurgling in the right iliac fossa, resulting, no doubt, from free action of the bowels induced by a purgative previously administered. Next day the tongue is dry and brown, and seven elevated rose-coloured papulæ, completely resembling those of enteric fever, are scattered over the abdomen and chest. There is no trace of eruption, or of that roughness of the skin which precedes it, on the face or any other part of the body. In this stage it will be impossible to decide whether the case is one of small-pox or enteric fever, and we must defer our diagnosis for a while. A few hours, however, will be sufficient to decide the matter. In the case alluded to, after a copious sweat the papules became harder and more prominent, and others began to appear on the face and limbs, and the case proved to be one of discrete variola.

Chronic Tubercular Peritonitis presents many of the symptoms of enteric fever. The hectic flush, pinched features, abdominal pain, tenderness and gurgling, anorexia and diarrhœa, are all present in this disease, but the tongue is usually moist and clean, there is no eruption, and frequently the abdomen is distended with effusion; moreover, there may be evidence of tubercular deposit in the lungs.

PROPHYLAXIS AND DISINFECTION.—Whenever a case of enteric fever occurs in a given locality, we must examine into the condition of the drains and the nature of the drinking water, and ascertain whether there be an offensive accumulation of decomposing animal matter near the house. If it can be done speedily and without temporarily increasing the nuisance, drains should be cleared and flushed, and offensive accumulations removed. In the absence of all other water, that which is contaminated must be filtered through charcoal and boiled before it is used; but whenever it is practicable the patient should be removed to a healthy locality. The dejections of patients suffering from the disease should be mixed with solutions of chloride of zinc or lime, or with a small quantity of hydrochloric acid, and be speedily removed. Bad odours should be traced at once to their source and the cause removed, or their diffusion prevented by the substitution of stench-traps for open grating. A sufficient fall for the sewage should be provided, and in seasons of drought the drains should be occasionally flushed. Pipes connecting the waterclosets with the drain or sewer should be constructed of iron, and always placed on the *outside* of the wall of the house. If made of lead (which is readily eroded by rats) and carried down the *inside* of the house, the apartments are liable to be filled with foul air derived directly from the sewer.

When it is necessary to open a drain, or to empty cesspools, disinfectants should be freely used, and the air thoroughly impregnated with free chlorine. Fresh mould, lime, soot, and solution of chloride of zinc should be mixed occasionally with the offensive matter. The chlorine may be evolved from a mixture composed of ℥iv each of finely powdered black oxide of manganese and common salt, and ℥viii of sulphuric acid diluted with a little water, placed in a deep dish.

TREATMENT.—In the present state of our knowledge enteric fever must be treated as a purely local disease. We presume ulceration of the intestines, and we fear its worst results. We know of no means of preventing the deposition of morbid material in the glandulæ of the intestinal canal, and when the patient comes under our notice it is generally too late to adopt an eliminative plan of treatment with the view of preventing further deposit and of removing that already formed. If, however, we see the case sufficiently early and have grounds enough to form a diagnosis, we may hope to arrest its further progress by judicious treatment. We shall often find that the alvine secretions are retained, and in many cases the secretions defective. The bowels should be carefully relieved by means of castor oil and enemata, and then we may administer small and repeated doses of grey powder until the constitutional effects of mercury, slight redness and tumidity, with tenderness of the margin of the gums, appear.

The diet must be carefully regulated: all solid food must be avoided; eggs, milk, and arrowroot in various combinations should form the staple articles of food. The eggs should be lightly boiled, or given in emulsion with coffee or tea. Beef-tea may be frequently given; a few ounces of red wine may be allowed from the first, and increased to a pint or more during the progress of the disease if the strength fails.

If at any time in the course of the disease the bowels be constipated, ℥ss of castor oil in combination with 10 drops of tincture of opium may be given. Sickness is best combated by iced soda-water to which a few drops of hydrocyanic acid have been added. If there be much abdominal tenderness half a dozen leeches may be applied to the right iliac region, or around the margin of the anus. If the pain and tenderness be slight, hot fomentations, mustard poultices, or turpentine stupes, applied to the abdomen, may be sufficient. The diarrhœa must be kept within the limits of one or two loose stools a day, and for this purpose we may employ the medicines prescribed in Forms. 166, 175. Moderate doses of opium alone are sometimes sufficient. If it continue unrestrained by these remedies we must use in addition an enema once or twice a day, composed of ℥iij of starch water and xv drops of tincture of opium. If hæmorrhage occur, we must increase the dose of the astringent, or we may substitute for the lead and copper salts, five-grain doses of gallic acid; cold fluids should be given, and a bladder of ice placed over the right iliac fossa. Turpentine in x or xx minim doses is a valuable remedy in hæmorrhage, and it is also useful in relieving the tympanites that often accompanies it. Assafœtida enemata are also useful in tympanites, which is sometimes very great, and while it causes severe pain, it at the same time places the life of the patient in great jeopardy, laceration of the diseased and attenuated coat of the intestine being very imminent in this distended condition.

If peritonitis, with or without perforation, supervene, we must exhibit opium very freely; i or ii grains of the powder may be given every two or three hours; hot fomentations, or a large blister, may be applied to the abdomen. Hiccough is often a most painful complication, but may be readily relieved by the inhalation of chloroform.

In the absence of very severe symptoms, small doses (½ grain) of quinine in combination with xv drops of dilute sulphuric acid, and an ounce of decoction of cinchona, may be given twice or thrice a day throughout the disease.

Head symptoms and pulmonary complications require such treatment as is recommended in typhus fever.

During convalescence we must patiently pursue the same plan of treatment as regards diet and tonic astringent medicines. As the appetite improves and the stools become less frequent, darker and more solid, we may increase the quantity of food, and substitute another egg and a little fish in place of beef-tea, but on no account must solid meat or vegetables be taken for a full fortnight after the stools have become solid. An egg boiled moderately hard will sometimes be sufficient to produce a recurrence of diarrhœa and bring on a relapse. Cod liver oil is useful, when the stomach bears it, in removing emaciation.

RELAPSING OR FAMINE FEVER.

Synonyms.—Five or seven days' fever. Epidemic remittent fever. Bilious relapsing fever. Famine fever.

Definition.—A contagious fever, of from three to seven days' duration, abruptly terminating, and recurring after complete apyretic intervals of about a week.

Symptoms.—Sudden and severe rigors, coming on without premonitory symptoms, and when the person is engaged in his ordinary occupations; severe headache and muscular pains speedily follow. After an hour or two, intense febrile symptoms appear, with a full, bounding pulse; a dry, burning skin; the tongue is coated with a white fur; there is severe pain in the epigastrium and vomiting of bilious fluid or of black, coffee-ground matters. The bowels are constipated and the urine scanty and high-coloured. On the third, fourth, or fifth day jaundice occurs in 20 per cent. of the cases. The stools are dark or even black, and melæna is sometimes noticed. The headache assumes a throbbing character; the intellect remains quite clear; but there is constant watchfulness and great restlessness.

At the end of five or six days, sometimes earlier, sometimes later, the patient breaks out into a profuse perspiration, often accompanied by diarrhœa, and sometimes by intestinal or uterine hæmorrhage: the febrile symptoms are thus brought to an abrupt termination, and the patient feels perfectly well, eats, drinks, and goes about as usual. After a week, or more rarely a fortnight, he suddenly relapses into his former febrile condition. This second attack may be less or more severe than the first: in the latter case severe jaundice and delirium may be present. After usually three days, a second intermission occurs, and the patient is restored again for a time to comparative health, complaining only of slight languor. A second or third relapse, at intervals of a week, may occur; but in some cases the patient recovers without a single relapse. Occasionally sudden collapse takes place, the patient becomes cold, livid, and comatose, and dies a few hours after the accession of the disease.

COMPLICATIONS AND CONSEQUENCES.—*A critical diarrhœa*, in some cases slight, and readily controlled; in others restrained with difficulty, and attended with considerable griping and tenesmus. Occasionally severe *dysenteric symptoms* persist, and cause death. *Chronic inflammation of the mucous membrane of the pharynx and trachea* is of occasional occurrence. *Menorrhagia and abortion* are frequent complications in women.

MORTALITY.—Relapsing fever is not very fatal. Of 441 cases admitted into the London Fever Hospital, only 11 = 2½ per cent. were fatal. The mortality, however, is greater in some epidemics than in others. In the Scotch epidemic of 1843, it was as high as 4 per cent.

PROGNOSIS.—*Favourable*, if the patient be young and vigorous, and in the absence of complications. *Less favourable*, after middle age, if much jaundice be present, and persistent diarrhœa supervene. *Unfavourable*, if there be suppression of urine.

PATHOLOGY.—No specific lesions of structure are found in this disease. The tissues are usually more or less jaundiced. If gastro-intestinal symptoms have been present, patches of ecchymosed mucous membrane may be found in any part of the alimentary canal. The lower part of the *ileum* in particular is usually greatly congested; but neither Peyer's patches nor the mesenteric glands are in any way diseased.

The *liver* is congested, the gall-bladder and ducts are healthy; but the bile is dark and very thick. The *spleen* is greatly enlarged, engorged, and soft. The *blood* is said to contain an unusual number of white corpuscles. The *kidneys* are commonly congested.

GEOGRAPHICAL DISTRIBUTION.—Relapsing fever, like typhus, appears to be more prevalent in Britain and Ireland than elsewhere. Ireland is its favourite habitat, and it has oftener prevailed in Scotland than in England. It has been observed among the inhabitants of Silesia, and in 1855 attacked our troops in the Crimea. It has been observed in several parts of North America. It is unknown in tropical countries.

CAUSES.—1. *Predisposing. Recent residence in London.* "Of 380 cases admitted into the London Fever Hospital, in which the circumstance was noted, one-eleventh had not resided in London more than three months, and many only a few days; more than one-seventh had not resided more than six months; and considerably upwards of one-fourth not more than a year."—*Murchison.*

Overcrowding and destitution favour the propagation of relapsing fever. The patients admitted into the London Fever Hospital come from the poorest and most populous districts, and the severest epidemics have occurred in times of famine.

2. *Exciting. A specific poison* generated in the bodies of persons in a state of starvation, and readily communicated to others. Medical men who have had experience of the disease are almost unanimous in the opinion that it is infectious. It successively attacks the members of a family, and spreads through contiguous houses. There are fair grounds for assuming that the disease has been several times imported both into England and Scotland from Ireland. The Scotch epidemic of 1847 has been ascribed to the immigration of a large number of destitute Irish; and the epidemics in New York and other North American towns have been referred to the same cause. Medical men and nurses are liable to take the disease from patients.

DIAGNOSIS.—Relapsing fever is liable to be mistaken for the other infectious fevers, and also for remittent fever. From *typhus* and *enteric fevers* it is distinguished—1. By its sudden invasion, without any warning. 2. By the absence of rash. 3. By the complete intermission and relapse. In typhus fever cerebral symptoms are prominent. It is only in those rare cases of relapsing fever in which collapse and coma come on, that we can confound the two diseases. Enteric fever comes on imperceptibly, and the febrile symptoms are but slight in the earlier part of this disease. Moreover, vomiting, jaundice, and enlargement of the liver and spleen are often present in relapsing fever.

Relapsing fever is much more likely to be mistaken for *Remittent fever*, but the latter disease occurs in a malarious district, and it is non-infectious. Drs. Graves and Stokes, of Dublin, have called relapsing fever the "yellow fever of the British Islands." There are, indeed, so many points of resemblance between them, that the yellow fever of the tropics would appear at first sight to be little more than a severe form of relapsing fever. But as far as our knowledge extends, the diseases differ in their origin, their predilection, and modes of propagation, and we are therefore bound to regard them as distinct maladies.

Lastly, the access of relapsing fever may be confounded with that of *Variola.* Lumbar pain, vomiting, and high fever attend the onset of both diseases; and, unless jaundice make its appearance, we may for the first day be uncertain whether the case is one of relapsing fever.

Treatment should be directed to the relief of the congestion of the internal organ. Vomiting may be encouraged for a time; or, if it be absent, it may be induced (Form. 220). Cholagogue purgatives (Form. 275) should then be given. If there be much tenderness or pain in the hypochondria, leeches may be applied to these regions or to the margin of the anus. The headache may be relieved by a bladder of ice or a stream of iced water. Perspiration should be elicited by saline diaphoretics.

We must carefully notice the quantity of the urine. If it be little, we must resort to the treatment required in such a case (see *Suppression of Urine*). During the intermission great attention must be paid to the action of the bowels; the secretion of the liver should be encouraged, and, if excessive, controlled, but not stopped. An occasional dose of calomel will be of much service if dysenteric symptoms be absent. Tenesmus requires relief by opiate, suppository, or enemata.

Quinine and acids, in full doses, should be persevered in for a time in ordinary cases.

CHAPTER IV.

EXANTHEMATA—ERUPTIVE FEVERS.

DEFINITION.—Contagious diseases, attacking a person, for the most part, only once, beginning with fever, and followed, after a short and nearly definite interval, by cutaneous eruptions.

VARIOLA	Small-pox.
VACCINA	Cow-pox.
VARICELLA	Chicken-pox.
RUBEOLA	Measles.
SCARLATINA	Scarlet Fever.
DIPHTHERIA	Diphtheria.
PESTIS	Plague.

VARIOLA—SMALL-POX.

DEFINITION.—A contagious and infectious disease, setting in with severe febrile symptoms, followed by an eruption which passes through the successive forms of papule, vesicle, and pustule in about eight days.

VARIETIES.—1. Variola discreta, distinct small-pox. 2. Variola confluens, confluent small-pox. 3. Varioloid, modified small-pox. Sydenham and Frank have also described a "Variola sine eruptione."

1. VARIOLA DISCRETA—DISTINCT SMALL-POX.

SYMPTOMS.—Rigors, lassitude, headache, severe lumbar pains, extreme weakness in the back, and a white furred tongue. nausea, vomiting, and tenderness of the epigastrium. Drowsiness and sometimes coma, and in infants convulsions or epileptic fits, are occasionally present. The symptoms are followed by inflammatory fever, with full frequent pulse, hot and dry skin, diminished secretions, restlessness, and, in some cases, delirium. The patient continues in this condition until the eruption, which is often preceded by sweating, appears. A diminution of the fever occurs at this time.

At the end of *forty-eight hours* from the first occurrence of rigors, but sometimes earlier, and sometimes as late as the fourth day, the eruption appears on the face and forehead as distinct minute papulæ, about the size of a pin's head, sensibly elevated above the surface of the skin, and feeling like small shot beneath the finger.

During the *third* day, or the *third* and *fourth* days, the eruption extends over the rest of the face, and travelling downwards, successively involves the neck, shoulders, arms, and hands, trunk, legs, and feet. It is usually most abundant on the exposed parts of the body. On the covered parts the papules are rose-coloured.

About the *fifth* day, a minute circular vesicle, depressed in the centre, containing a colourless fluid, and surrounded by an inflamed areola or margin, may be seen on the top of each pimple. The eruptive fever now rapidly declines.

About the *sixth* day, there is some swelling of the throat, with difficulty of swallowing, hoarseness, and a flow of viscid saliva. These symptoms arise from the extension of inflammation, or of the eruption itself, to the lining membrane of the mouth and fauces, where it can be seen in the form of small round white spots. The eyelids, the prepuce of the male and labia of the female, are similarly affected.

By the *eighth* day, the central depression has disappeared, the areola has attained its full size, and the contents of the vesicles have become purulent. The face swells ; the eyelids are often so enlarged as to close the eyes ; and the mouth, nose, and fauces are covered with pustules.

By the *eighth* or *ninth* day, the pustules have attained their full size, and are marked by a brown central spot. The inflammatory areola subsides, the swelling of the face disappears, and the hands and feet begin to swell.

After this time the pustules break, and their contents ooze out, and, drying on the surface, form crusts, which in a short time fall off, and leave the skin beneath of a purplish-red colour, which often persists for weeks. The swelling of the hands and feet gradually subsides, and about the seventeenth day the patient is convalescent. In the more severe cases permanent white scars are left upon the skin of the face, and of the exposed parts of the body.

The period occupied by the change from pimple to pustule is called the period of *maturation*. At different stages of this process, according to the amount of eruption, but generally as early as the eighth day, *secondary fever* sets in, characterised by extreme restlessness, sleepless nights, a frequent and quick pulse, a dry brown tongue, scanty and high-coloured urine, and frequently by delirium, especially at night. The bowels are usually constipated, sometimes obstinately so.

2. VARIOLA CONFLUENS—CONFLUENT SMALL-POX.

SYMPTOMS.—Confluent small-pox differs from the distinct form only in degree. The eruptive fever is more intense, and increases from the first appearance of the rash to the period of maturation. The *secondary fever* is also more severe, and often assumes the typhous character. Coma and delirium are more frequent concomitants ; and severe diarrhœa sometimes sets in.

The eruption is also irregular in its appearance and progress. It is usually preceded by a red efflorescence upon the swollen skin, from which the pustules emerge on the second day in the form of small red points. Maturation takes place earlier ; but the pustules, instead of being globular, are flat and irregular, and sometimes contain, instead of pus, a brownish ichor. The inflammation extends to the subjacent cellular membrane, and sometimes ends in extensive sloughing. The swelling of the face and salivation commence early, and rise to a great height. The fever, though it generally undergoes a slight remission, does not cease, upon the appearance of the rash; and about the ninth day it suffers a remarkable exacerbation, and in some instances all the worst symptoms of the typhous condition supervene. The eruption assumes a dark livid or black hue; petechiæ, and passive hæmorrhages, bloody urine or dysentery, make their appearance; there are coma, convulsions, and sordes on the lips and teeth, and the patient is often carried off on the night of the eleventh day. In cases of recovery, the scars are much deeper and more extensive than in the milder form.

3. VARIOLOID—MODIFIED SMALL-POX.

Small-pox may be greatly modified in its severity, and otherwise changed in character by two causes:—Vaccination, and a previous attack of the disease.

Small-pox modified by a previous attack, or by vaccination, differs in several respects from the disease as it occurs in unprotected persons. The principal points of distinction are the following:—The eruptive fever, though often extremely intense, generally continues during only one day. The patient often complains of some indisposition in the afternoon, passes an extremely restless night, and finds the eruption out in the morning. The first places in which it makes its appearance are generally the wrist and alæ of the nose. A pimple appearing in the latter situation, will often give the clue to the nature of the disease. The eruption itself runs a shorter course, is rarely confluent, and presents none of the uniformity of the regular disease. A few of the pustules, though small, are regularly formed, and present the central depression. Several of the pimples do not pass to the form of vesicles, and the vesicles themselves shrivel and dry up (*Horn-pock*), or they are unusually persistent, and from their transparent appearance are called *Pearl-pock*. All the stages of the eruption may be seen on the body at the same time, and all of them imperfect. As soon as the eruption appears, the patient is well, unless it happen to be sufficiently extensive to give rise to secondary fever.

CAUSE.—A specific poison, emanating from persons labouring under the disease, or from clothes or other articles worn or used by them; or implanted by the introduction of the variolous matter into the system by inoculation, or by the application of the scab.

PROGNOSIS.—*Favourable.*—The pustules distinct; the march of the disease regular; the subject healthy. The period of childhood and youth. The modified form of the disease. *Unfavourable.*—The confluent form; the fever assuming the typhous condition, and the pustules becoming flattened, livid, or interspersed with petechiæ. The sudden disappearance of the rash, with subsidence of the swelling of the face or extremities, and depression of the pustules, followed by great prostration of strength, universal pallor, great anxiety, oppression at the chest, syncope, convulsions, coma, or delirium. A sudden increase of frequency in the pulse, great dyspnœa. Excessive vomiting before the rash, and continued after its appearance. Blood in the urine, and other secretions. Complications with visceral disease, such as inflammatory affections of the brain, of the throat, larnyx, or lungs, or of the alimentary canal, and suppurations in these viscera, or in the joints. Infancy, and advanced age.

In general, the fate of the patient is determined in the interval between the eleventh and seventeenth day, but death may take place during the primary fever. The crisis of the secondary fever is occasionally accompanied by diarrhœa.

SEQUELÆ.—Abscesses, ulcers, boils, suppuration of the glands of the neck, sloughing of the skin, erysipelas, suppuration of the joints, resulting in permanent lameness; ophthalmia, followed by blindness from opacity of the cornea; deafness, following suppuration of the internal ear; suffocation from swelling of the glottis; inflammation of the serous membranes of the chest and abdomen; pleurisy, terminating in empyema; inflammation of the lungs; hæmoptysis; hæmaturia, inflammation and suppuration of the kidneys; in females, menorrhagia; in pregnant women, abortion. Melancholia followed by mania may occur at this period. During convalescence, patients may be attacked with other prevalent diseases, such as typhus fever, erysipelas, and hospital gangrene.

MORBID ANATOMY.—On the skin, the eruption already described. On the conjunctiva of the eye, and on the lining membrane of the air-passages, on the mouth, tongue, nostrils, palate, and fauces, on the prepuce and labia, small patches of false membrane, or of detached epithelium, or denuded spots of mucous membrane, or actual pustules. In rare cases, these appearances extend into the bronchial tubes and through the whole length of the intestines. There are traces of inflammation in various internal organs; the texture of the viscera is often softened, and putrefaction makes rapid progress.

DIAGNOSIS.—The suddenness of the attack, the intense pain in the head, back, and loins, the sickness, the absence of the local affections of the other severe exanthemata, the prevalence of the disease at the time, and the exposure to contagion, afford a probability in favour of small-pox. The regular succession of appearances, and of changes in the eruption, afterwards renders the distinction easy. Before the appearance of the eruption the diagnosis is often exceedingly difficult. A typical case may be mistaken for *relapsing fever* (page 305); a modified form may be difficult to distinguish from *enteric fever* (page 301). The primary fever may be accompanied by profuse sour-smelling perspiration, associated with general muscular pains, amongst which the lumbar pain is not particularly regarded; and we are liable to mistake the disease for *rheumatic fever;* and it is rheumatic fever, without doubt, but there is small-pox superadded to it. In the case which has suggested these remarks, profuse sour-smelling sweat continued for forty-eight hours before the rash appeared; the muscular pains remained for two days longer. In another case the eruption was preceded by a copious, finely maculated, fiery crimson petechial rash, overspreading the trunk and upper parts of the limbs, and confluent at the flexures of the arms and thighs into vivid crimson patches, surrounded by discrete but crowded petechiæ. The rest of the skin was of a dusky crimson colour, and the surface was intensely hot. Two rose-coloured papules were noticed on the chest: the lumbar pain was intolerable. Twelve hours afterwards the eruption began to appear; and, although it was far disproportionate to the petechial rash, the disease was of the confluent variety. At the outset such a case may be mistaken for *typhus*.

It is sometimes difficult to distinguish the papular eruption of small-pox from an acute attack of *syphilitic lichen*. In the early stage of the eruption of variola, the papulæ on the alæ of the nose and upper lip give a highly characteristic appearance to the countenance.

MORTALITY.—This is influenced by three conditions, viz., the age of the patient, the neglect of vaccination, and the severity of the disease. Childhood and old age both predispose to a fatal issue. According to Mr. Marson, patients of all ages die at the rate of 50 per cent. in the confluent form; 8 per cent. when the disease is semi-confluent; and of 4 per cent. in the discrete variety.

Annual fluctuation considerable, *e. g.*, in 15 years (from 1840 to 1854) the number of deaths in London, in a million inhabitants, was as high as 890 in 1844, and as low as 225 in the year preceding, and only 87 in 1853. This fluctuation is in part due to recent legislation.

LAWS OF INFECTION.—Communicated by contact or through the air, by the living and dead body; by the contents of the vesicles and pustules; by the dried scabs; or by substances imbued with the variolous matter. Infecting distance considerable—from 30 to 50 feet, or more. The period at which a patient begins to be able to communicate the affection, and at which he ceases to be dangerous to others, has not been ascertained. It rarely occurs twice in the same person; about one per cent. it is believed are liable to a second attack. May attack the fœtus in utero. *Period of incubation.*—Usual duration, twelve days; limits, ten to sixteen days.

TREATMENT. — *Before the appearance of the eruptive fever*, the treatment will be the same, whatever may be the nature of the impending disease. An emetic (Form. 220), followed by a brisk saline aperient (Form. 259), to remove any offending matter from the alimentary canal; local bleeding in the plethoric; the antiphlogistic regimen, if inflammatory symptoms run high; stimulants in extreme nervous depression; opium in great nervous irritability; bleeding and stimulants in congestion, to promote reaction, and to relieve the circulation. *During the eruptive fever* the febrile symptoms, if considerable, are to be moderated by exposing the body of the patient to a cool atmosphere, by frequently administering cold diluent fluids, as lemonade, cold toast-water, soda-water, &c.; at the same time administering saline aperients, so as to keep the bowels loose. Cold affusion may also be employed with advantage when there is much heat of skin; but cold or tepid sponging, limited to the hands and arms, is to be preferred.

After the appearance of the eruption, the indications are:

I. To moderate the fever when violent. II. To support the strength when deficient. III. To subdue local inflammation and relieve occasional symptoms.

I. As the fever at once subsides on the appearance of copious perspiration, our object must be to promote it. After an emetic we may give stimulant diaphoretics (Form. 229 or Form. 228), every four hours. A full dose of opium will generally be required at bedtime. The apartment must be kept cool and well ventilated.

II. If the patient's strength fail, he must be supported by tonics or stimulants, according to the degree of the existing debility. Quinine, or the tonic infusions, may be prescribed in the lesser degrees of weakness, wine and ammonia in the greater. If the patient is irritable and restless, as well as weak, opium may be combined with the tonic or stimulant.

III. Ophthalmia, if it be severe, will require leeches to the temples. In milder cases, solution of nitrate of silver (gr. v—℥i) should be applied. Olive oil, cold cream, or simply tepid water, are grateful applications to the swollen and irritable face.

If the throat be attacked, and there be difficulty in swallowing, leeches may be applied to the neck, and gargles of infusions of roses used.

Determination to the head or chest, or other viscera, must be treated by the remedies applicable to idiopathic inflammation of the same parts. Blisters and counter-irritants must be cautiously employed, especially in those cases where the skin is already the seat of inflammation.

Obstinate vomiting, which sometimes proves both troublesome and dangerous, is best treated by effervescent salines, with a few drops of laudanum. If there be tenderness at the epigastrium, a warm bread-and-water poultice may be applied, preceded, in severe cases, by a few leeches.

If the febrile symptoms indicate a typhous tendency, the treatment recommended in that stage of continued fever should be resorted to.

If, after the eruptive fever has passed away, the patient suffer from profuse sweats, a cool regimen, and the dilute mineral acids in combination with tonics (Form. 137), should be given.

Diarrhœa, when excessive, is to be checked by small doses of laudanum (3—5 drops), with chalk mixture, or by the Pulvis cretæ co. c. Opio, in doses of ten grains or a scruple every three or four hours.

When the eruption suddenly recedes, or the pocks sink and shrink, and alarming symptoms, such as rigors, convulsions, or delirium, supervene, recourse must be had to depletion and counter-irritants—leeches to the temples, blisters to the nape of the neck, and sinapisms to the feet and legs. The cold douche applied to the head whilst the body is in a warm or vapour bath, may be used with great benefit.

The secondary fever requires the treatment of continued fever of the same type and degree of severity. When much irritation is present full doses of opium are indicated.

In favourable cases little treatment is required beyond an occasional saline aperient, and the avoidance of excess in diet.

In all cases of small-pox the warm bath should be used repeatedly during the convalescence.

Prevention of pitting.—Various means have been recommended for this purpose. All of them consist either (1) in protecting the parts from the air; or (2) in letting out the contents of the vesicles before the change from lymph to pus; or (3) in exciting common, in place of specific, inflammation.

1. To protect the skin from the air, and to give support to the swollen skin, a mixture of equal parts of collodion and castor-oil may be painted over the face in males, and the face, neck, and arms in females.

2. Puncturing the full vesicles with a fine needle, and absorbing their contents with soft cotton, is an effectual method, but it is very tedious.

3. Nitrate of silver in substance, or in strong solution, applied to the pustules, is also advantageous. Tincture of iodine has been substituted for the solution of lunar caustic, and with benefit.

VACCINA—COW-POX, VACCINATION.

SYNONYMS.—Vacciola, vaccinia, kine-pox, vaccine disease.

The benefits conferred on mankind by the discovery of vaccination, as a preventive of small-pox, are now universally admitted.

VACCINATION.—*Mode of performing the operation.*—Three or four punctures are to be made near each other, in one or in both arms, about the insertion of the deltoid muscle. The skin being made tense, a sharp lancet is to be inserted obliquely downwards, so as to produce a trace of blood. The lancet must be perfectly clean and free from grease, in order that the vaccine matter may adhere to it. When the matter is taken from the arm of another child, the lancet should be dipped in the lymph of the vesicle, and then inserted in the punctures. If preserved on slips of glass, or on points, it must be first moistened by the breath.

DESCRIPTION OF THE AREOLA.

When the operation has been properly performed, the course of the eruption is somewhat as follows:—

Second day.—Small red spots appear, which feel hard, but, when viewed with a magnifier, are seen to be vesicular. *Third or fourth day.*—The spots are larger and more perceptible. *Fifth day.*—Small pearly circular or oval vesicles corresponding to the punctures, and containing a minute quantity of transparent fluid. *Eighth day.*—The vesicle has attained its perfect form and full size, with depressed surface and raised margin. On the evening of this day the vesicle begins to be surrounded by a circular rosy areola, and the skin for some distance round it is tense and painful. There is also slight febrile disturbance. *Ninth and tenth days.*—The areola increases, and is often accompanied by extensive erythema of the arm, and sometimes by a lichenous eruption over the whole body. *Eleventh day.*—By this time the vesicle, if it have not been opened, has burst, the areola has begun to fade, the centre of the vesicle is covered with a brown scab, which first hardens and blackens, and about the *twentieth* day falls off, leaving a deep mark, or indentation on the skin, of a circular form, with as many pits as there were cells in the vesicle, and proportioned in size to the previous inflammation. Unless all these appearances are observed the vaccine disease has been imperfectly communicated, and re-vaccination is absolutely necessary.

PRECAUTIONS.—The best time for taking the lymph is from the fifth to the eighth day ; after this time it cannot be depended on. The disease will not be properly communicated if there be a chronic eruption on the arms ; if scarlatina, measles, or other cutaneous disease supervene ; if dentition, disordered bowels, or any other malady be present ; or if any cause, such as friction or injury, disturb the vesicle. Sometimes boils, pustules, and leprous and impetiginous eruptions succeed the vaccine disease ; but this seldom happens when the child's health is good at the time of vaccination. Such eruptions are readily cured by mercurial alteratives and gentle aperients.

Infants may be vaccinated at any time after the sixth week. The age of three months is to be preferred, if the child be healthy.

As a rule, vaccination should be repeated every seven years up to or a little beyond the middle period of life. Re-vaccination may, however, be generally assumed to be unnecessary so long as the person can show three well marked excavated scars. As it may be practised without inconvenience, it may be well to resort to it when epidemics prevail, to insure protection or to allay the fears of timid persons.

The best argument for re-vaccination is the result of that operation in the Prussian army. In the year 1841 nearly 45,000 soldiers were re-vaccinated, and though before that time varioloid disease was very prevalent in the barracks, only eight cases occurred afterwards.

As it is highly important that the amount of protection afforded by vaccination should be understood, the following tables have been constructed :—

EPIDEMIC IN SCOTLAND, 1818–1819. DR. JOHN THOMPSON.

	Unprotected.	Small-pox second time.	Small-pox after Vaccination.
Cases	205	71	310
Deaths	50	3	1
Proportion . .	1 in 4	1 in 23	1 in 310

The following table, reduced to an uniform scale of 15,000, is founded on the facts recorded by M. Favart during an epidemic of small-pox which took place at Marseilles in 1828. The estimated population under 30 years of age was 40,000, of whom 30,000 had been vaccinated, 2,000 had had casual small-pox, or small-pox by inoculation, and 8,000 were unprotected.

MARSEILLES.—EPIDEMIC OF 1828.—ESTIMATED POPULATION, 40,000.

	Unprotected.	Previous small-pox or Inoculated.	Vaccinated.
Estimated number . .	15,000	15,000	15,000
Attacked	7,500	150	2,000
Died	1,875	30	10
Proportion attacked .	1 in 2	1 in 100	1 in 15
Proportion of deaths to attacks	1 in 4	1 in 5	1 in 100

In the Small-pox Hospital, during the 11 years 1841–1851, there were 4,091 admissions with small-pox, distributed as follows:—

	Patients.	Deaths.	Mortality per cent.
Not alleging any protection	1,722	629	37
Alleging prior small-pox	36	6	17
„ vaccination, but no scars . .	166	56	34
„ vaccination, and scars . . .	2,167	147	7

The inference to be drawn from these facts is, that vaccination, though a less complete protection against attacks of small-pox than inoculation or a previous attack of the disease, is the best existing protection against a fatal attack.

VARICELLA—THE CHICKEN-POX.

SYNONYMS.—Swine-pox, Bastard-pox, Gland-pox, Crystalli.

DEFINITION.—A contagious and infectious disease ushered in by slight febrile symptoms, followed by a vesicular eruption which generally runs its course in five days.

SYMPTOMS.—Within twenty-four hours after slight symptoms of fever, such as lassitude, loss of sleep, wandering pains, and loss of appetite, an eruption appears; first on the back, consisting of small reddish pimples, much resembling the first appearance of small-pox. On the *second* day, the red pimples have become small vesicles, containing a colourless fluid, and sometimes a yellowish transparent liquor. On the *third*, the vesicles arrive at maturity. Soon after, the fluid becomes extravasated by spontaneous or accidental rupture of the tender vesicles, or they collapse and dry; whichever happens, a thin dark-brown or yellowish scab is formed. Pus is never formed, as in variola. Generally before the *fifth* day the eruption disappears, without leaving behind it any cicatrix or mark.

CAUSE. — *Predisposing.* Infancy and childhood. — *Exciting.* Contagion.

DIAGNOSIS.—*From variola.* By the slight fever; by the short interval (24 hours) between the first symptoms and the appearance of the rash; by the pimples first appearing on the back; by the form and condition of the eruption, which is never pustular nor depressed; by the separation of the scaly scabs about the fifth day, when the eruption in variola is only just completed. From *modified small-pox* by the absence of pits from all the vesicles.

PROGNOSIS.—Highly favourable.

LAWS OF INFECTION.—The infection is less powerful than that of the other febrile exanthemata, and the infecting distance probably small. The disease, as a general rule, affects the system only once. The latent period is probably considerable.

TREATMENT.—This complaint seldom requires the aid of medicine. Gentle saline aperients may be prescribed, combined with small doses of tartar-emetic, if the fever should happen to exceed its usual moderate standard. The treatment may be terminated by a warm bath.

RUBEOLA—THE MEASLES.

SYNONYM.—Morbilli.

DEFINITION.—A continued contagious and infectious fever, commencing with catarrhal symptoms, and followed, about the fourth day, by a peculiar eruption on the skin.

VARIETIES.—1. Rubeola vulgaris; 2. Rubeola maligna; 3. Rubeola sine catarrho.

1. RUBEOLA VULGARIS.

SYNONYMS.—Morbilli vulgares; Morbilli mitiores.

SYMPTOMS.—The premonitory symptoms are those of catarrh. After rigors and flushes, lassitude, heaviness, pain in the head and drowsiness, there are ringing cough, hoarseness, difficulty of breathing, frequent sneezing, itching of the face, smarting of the eyes, and swelling of the eyelids, with copious secretion of watery fluid from the eyes and nostrils; nausea or vomiting, thirst, furred tongue, frequent pulse, and the general symptoms of fever. On the *fourth*, but sometimes as early as the third, or as late as the fifth day, small red circular spots, resembling flea-bites, appear, first on the face, neck, and upper extremities, then on the trunk, and afterwards on the lower extremities. The three crops of the eruption are commonly separated by an interval of twenty-four hours. The spots are generally in crescentic clusters, of a deep-red colour, do not rise into visible pimples, but are found by the touch to project slightly above the surface. Sometimes, however, the spots are distinctly papular, and, at the height of the eruption, vesicular. About the *eighth* day, but sometimes as early as the *fifth* or *sixth*, the colour of the rash begins to fade; first upon the face, neck, and arms, then upon the trunk, and lastly on the legs: and, in a day or two more, the eruption entirely disappears, with a mealy or furfuraceous desquamation of the cuticle. At this period diarrhœa sometimes sets in. The fever and catarrhal symptoms subside at the same time, and the expectoration changes from a transparent mucus to an opaque-whitish or yellowish-white sputum.

The catarrhal and febrile symptoms sometimes subside on the appearance of the rash; but in most cases they increase, and are often accompanied by pulmonary symptoms, the cough becomes troublesome, and the breathing short, frequent, and wheezy. The stethoscope reveals bronchitis more or less diffuse. Pneumonia occasionally supervenes.

The usual duration of the disease is from nine to twelve days. The patient often convalesces very slowly.

2. RUBEOLA MALIGNA.

SYNONYMS.—Morbilli nigri; Morbilli graviores.

This form is ushered in by more severe premonitory symptoms, and soon assumes the typhous character. The eruption appears early, but irregularly, alternately receding and reappearing. It assumes a dark or livid hue (*rubeola nigra*), and is often interspersed with petechiæ. The fauces are of a dusky-red or claret colour. All the symptoms are aggravated; there is great tenderness in the abdomen, with dark offensive stools; delirium is present, the mucous membrane of the air passages is gravely affected, croup and severe pneumonia are imminent, and the patient may die asphyxiated by the congestion of the lungs, or exhausted by diarrhœa, or comatose from the severity of the head-affection.

3. RUBEOLA SINE CATARRHO.

In rare instances the primary fever and eruption show themselves in a mild form, without the accompanying catarrhal symptoms. On the other hand, cases are believed to occur in which a fever, resembling in character and duration that of measles, takes place with catarrhal symptoms, but without the rash.

CAUSE.—*Predisposing.* Infancy and childhood; but the disease may occur at any age. The seasons of winter and spring.—*Exciting.* A specific contagion, of which patients are generally susceptible only once during their lives.

MORTALITY.—This varies in different epidemics from 1 in 3 to 1 in 40, the average being 1 in 15. Annual fluctuations considerable; *e.g.*, 1,122 deaths in London in one million inhabitants in 1845, and only 249 deaths in 1852.

LAWS OF INFECTION.—The disease spreads by fomites and through the air; it may also be communicated by blood from the arm, or by serum from the vesicles mixed with the rash. It very rarely occurs a second time. The period of incubation is believed to be from 6 to 16 days; and there is reason to think that the disease may be communicated during the primary fever.

DIAGNOSIS.—From *Scarlatina* by the darker hue of the rash, the crescentic arrangement of the patches, and its appearance, as a general rule, on or about the fourth, instead of the second day. Also by the marked catarrhal symptoms, and the absence of the severe affection of the throat; by its shorter course; and by its less fatal character. From *Roseola*, by the catarrhal symptoms; and by the greater severity of the fever. From *Typhus*, see page 293.

PROGNOSIS.—Generally favourable, excepting in the malignant form. —*Favourable.* The febrile and other symptoms slight; moderate diarrhœa; epistaxis; early and free expectoration; a moist skin when the eruption appears.—*Unfavourable.* A high degree of fever; hot and dry skin; hurried and difficult breathing; flushed countenance. The fever increasing after the appearance of the rash, and assuming the form of hectic, or of typhus; great pain in the head and eyes; shooting pains in the chest; symptoms of pneumonia or cynanche; convulsions; a rapid and small pulse; co-existence with whooping-cough; delirium, or coma; continued diarrhœa or vomiting; a livid hue of the skin.

SEQUELÆ.—Pneumonia, œdema of the lungs, pleurisy, croup, bronchitis, phthisis; diarrhœa, enlargement of the mesenteric glands; ophthalmia, abscesses in the ear, swelling and suppuration of the parotid, submaxillary or cervical glands; aphthæ and gangrene of the mucous membrane of the mouth; whooping-cough.

MORBID ANATOMY.—Marks of inflammation in the internal organs, especially the air-passages and lungs.

TREATMENT. *Indications.*—I. To diminish inflammatory action. II. To relieve urgent symptoms.

I. The temperature of the room should be about 70° Fahr. and uniform, and currents of colder air must be carefully excluded. The diet should consist of thin gruel, milk and water, or beef-tea containing a little bread or vermicelli.

The action of the skin should be encouraged, and bronchial or pneumonic irritation alleviated by the application of large hot poultices of linseed meal, with or without a little mustard, to the throat and chest.

The bowels should be freely relieved by an active purgative, such as from gr. xv to gr. xl of compound jalap powder.

When the febrile symptoms run high, and more especially when there is a threatening of local inflammation, tartar-emetic must be given in nauseating doses, at short intervals.

II. In milder cases it will be sufficient to administer saline refrigerants and diaphoretics in combination with squills or ipecacuanha (Form. 243).

Lemonade, linseed tea, a decoction of figs in milk, or barley-water, should be liberally supplied, as they are grateful to the inflamed mucous membrane. Inhalations of steam may be used with advantage.

If need be, we must administer sedatives to counteract restlessness and encourage sleep. A combination of henbane and opium will be most suitable for these purposes.

If there be much heat, and dryness of the skin, a hot bath should be given.

Pneumonia, diarrhœa, whooping-cough, or any other complication, must be treated according to the urgency of the symptoms.

The malignant form of the disease must be treated generally, as low fever (see *Typhus*), with special reference to the bronchial affection.

When the eruption disappears before the proper period, and convulsions, great anxiety, or delirium take place, an attempt must be made to restore the eruption to the skin, by the immediate use of the hot bath, the application of sinapisms or blisters to the chest and feet, the administration of warm wine and water, ammonia, camphor, æther, or other appropriate stimulants.

During convalescence, the diet should be nutritious, the bowels regulated, and the dress warm. Great care should be taken to avoid exposure to cold, and draughts of cold air.

PROPHYLAXIS.—The same precautions are required to prevent the spread of the contagion, as in the case of other contagious maladies. Inoculation with blood taken from the patches, with the serum of the vesicles, when the eruption is vesicular, or with the secretion of the conjunctiva, has been practised with some advantage. The cases which have followed inoculation have been mild and favourable.

SCARLATINA—SCARLET FEVER.

DEFINITION.—A continued contagious and infectious fever, accompanied by inflammation of the fauces, and by a scarlet eruption on the skin, setting-in on or about the second day, and terminating in desquamation of the cuticle.

SPECIES.—1. Scarlatina simplex; 2. Scarlatina anginosa; 3. Scarlatina maligna; 4. Scarlatina sine eruptione.

1. SCARLATINA SIMPLEX.

SYMPTOMS.—This disease is characterised by the slight affection of the throat. It sets in with the usual premonitory symptoms of fever —viz., cold chills, shivering, nausea, and sometimes vomiting, with pain in the head, back, and limbs, thirst, hot skin, frequent pulse, restlessness, and sleeplessness. On the *second* day, in most cases, a bright scarlet efflorescence is perceptible on the face, neck, and arms, whence it extends over the trunk and limbs. At first it consists of innumerable red points, which soon coalesce, so that in a few hours the redness becomes universal; but is peculiarly distinct at the bends of the joints, on the chest and abdomen, the hips and loins. The skin is rendered pale by pressure, but the colour immediately returns. After *one* or *two* days, the efflorescence again becomes partial, is arranged in large irregular patches, and does not disappear on pressure. The skin is perceptibly rough to the touch, and in some instances is studded with small miliary vesicles. The rash generally begins to decline on the *fifth*, is very indistinct on the *sixth*, and wholly disappears by the *eighth* day. Desquamation of the cuticle generally begins on the parts first affected about the end of the *fifth* day, and soon extends to the entire body. The cuticle separates as a scurf from the trunk and limbs, and in large scales from the hands and feet. The desquamation is often accompanied by great itching, irritation, and tenderness.

The eruption is preceded or accompanied by a sore throat, and some difficulty of swallowing; and, on inspection, the tonsils are found slightly enlarged and inflamed, and coated with a white tenacious mucus. The eyelids, lips, edges of the tongue, soft palate, pharynx and nostrils, are also of a red colour. The papillæ of the tongue are elongated, and project as bright-red points through the white mucus which covers its surface; or the whole tongue is of a bright-red colour with prominent papillæ. In the first case it resembles a white strawberry; in the second a red one.

The fever does not abate on the appearance of the rash, but subsides with it, leaving, in most cases, great debility behind it. The pulse is generally very frequent (120 or 130), and the skin very hot (105°, 106°, and even 112° Fahrenheit). There is generally some increase of fever at night, with slight delirium, even in favourable cases. The bowels are frequently confined, and nausea and vomiting are not very uncommon. The urine is often scanty and high-coloured, and, in the decline of the disease, generally contains albumen.

Although the eruption in scarlet fever usually occurs on the second day, there are many exceptions to the rule. On the one hand there are cases in which the rash appears much earlier than the second day, as in a lad of sixteen, who felt ill for the first time at five o'olock in the evening, and had the eruption full out upon him before twelve o'clock at night. On the other hand, during the prevalence of scarlet fever, cases are constantly occurring in which there is slight sore throat, and a suspicious appearance of tongue, with little disturbance of health for three, four, or five days, at the end of which time the eruption makes its appearance, and the disease generally runs a mild course. These cases present some difficulty; but however slight the other symptoms may be, there is always during this latent period a very frequent, full, and peculiarly compressible pulse. Whenever this pulse exists, some febrile disease (and scarlatina, if rife at the time) may be confidently looked for. (G.)

2. SCARLATINA ANGINOSA.

SYMPTOMS.—Those of scarlatina simplex, but in an aggravated form, with a more severe affection of the throat and parts adjacent.

The submaxillary glands are enlarged and painful to the touch; the soft palate, uvula, tonsils, and pharynx, as far as the eye can reach, are of a florid red colour, the tonsils and soft palate much swollen, and the uvula enlarged and lengthened. A thick mucus collects at the back of the throat, and proves very troublesome to the patient, and specks are often observed resembling the sloughs in cynanche maligna; yet ulceration seldom takes place, and when it does occur, is superficial. Smooth yellow patches of fibrous exsudation frequently form over the inflamed, excoriated, or ulcerated tonsils or pillars of the fauces, in all respects resembling the exsudation of diphtheria. The mouth is opened with difficulty, there is great pain in swallowing, and liquids often return through the nostrils. The tongue is very red, and its papillæ are very prominent. The inflammation may extend to the mucous membrane of the nose, and through the Eustachian tube to the ears, followed by thin purulent discharge from those parts. The skin is of a deeper colour, and the eruption spreads more rapidly over the surface.

Not unfrequently, after a few days' amendment, an unaccountable languor and debility supervene; the pulse is accelerated; the sleep is disturbed; the appetite is lost; the secretion of urine is nearly suppressed; and dropsical effusions take place into the limbs, abdomen, or chest, or in several parts of the body at the same time.

3. SCARLATINA MALIGNA.

Symptoms.—The tonsils, though less swollen than in scarlatina anginosa, are of a deeper red colour, and soon become the seat of rapid, extensive, and deep ulcers, interspersed with dark sloughs, which are detached slowly, leaving deep ragged sores, which heal with difficulty. Ashy ulcers also form on the interior of the cheek. The inflammation, extending into the nostrils, causes a thin acrid discharge, which excoriates the lip and inflames the parts over which it flows, and the salivary glands are much swollen and inflamed. The eruption appears late, in irregular patches of a paler colour, which sometimes disappear suddenly. The other symptoms are those of the typhous form of continued fever.

4. SCARLATINA SINE ERUPTIONE, OR S. LATENS.

Sometimes the disease assumes so mild a form as altogether to escape detection till some sequela, such as general anasarca, appears to declare that the slight indisposition, "a feverish cold," was an attack of scarlatina. We must be careful not to overlook such cases, as, from want of proper nursing and precautions, the consequences they entail are as bad as, or even worse than, those of a severe form of the disease.

It is not uncommon for those who have had scarlet fever in its usual form, when again exposed to the contagion, to have the characteristic sore throat succeeding the usual premonitory symptoms, but no eruption. Desquamation of the cuticle, however, occurs in some of these cases, where no distinct rash has appeared on the skin. Such persons are capable of communicating the common type of the disease.

Duration of Scarlet Fever.—In cases of ordinary severity, the first state (from the commencement to the appearance of the rash) twenty-four, forty-eight, or seventy-two hours; the second stage (from the appearance of the rash to its subsidence) from six to eight days, and the third stage (from the disappearance of the rash till the recovery of the patient) from a few days to two or three weeks. Entire duration of the disease from eight days to thirty days, or more.

SEQUELÆ.—Acute desquamative nephritis, with anasarca, and occasionally with other dropsical affections, such as ascites, hydrothorax, hydrocephalus, and hydropericardium. These diseases often follow the mildest attacks. The other sequelæ show themselves mostly after attacks of scarlatina anginosa or maligna. They are the following:—Pain and swelling of the larger joints, with formation of serum, or pus; scrofulous affections; discharge from the nostrils; discharge from the ears, and permanent deafness; suppuration of the glands of the neck; troublesome ulcers of the tongue, pharynx, or epiglottis; croup; inflammation of the eyes and eyelids; inflammatory affections of the internal viscera or of their serous investments; abscess of the testis; mortification of the face, lower extremities, and pudenda; also of portions of the integuments on which the patient has lain; troublesome diarrhœa. Abscess of the brain is a remote result of some cases of scarlatina which have been followed by pain and suppuration of the ear. The membrana tympani and small bones of the ear are destroyed, suppuration is set up in the cancellous tissue of the petrous bone, and necrosis occurs, and the neighbouring veins may become implicated and lead to purulent deposits in the brain, indicated by intolerable pain in the corresponding part of the head, quickly followed by coma, preceded or not by convulsions.

TERMINATIONS.—In complete recovery. In complete recovery after one or more of the foregoing sequelæ. In imperfect recovery, the patient suffering from the effects of one of these sequelæ. In profound coma on the first appearance of the rash, followed by death in twenty-four hours, as if from the effects of a strong narcotic poison; violent delirium during the first five days of the fever. In death on the first, second, or third day, with incessant vomiting, or diarrhœa, or the two combined. In death at more advanced periods of the disease from exhaustion, or from the effect of any of the sequelæ.

POST-MORTEM APPEARANCES.—Ulceration and purulent collections in the tonsils, with traces of inflammation extending from the fauces through the œsophagus, and sometimes through the whole alimentary canal. Congestion or inflammation of the kidneys. Inflammation and swelling of the joints. If the patient die from delirium and coma, great congestion of the vessels of the brain will be found.

CAUSES.—*Predisposing.* Bad food and water.—*Exciting.* A specific contagion.

MORTALITY.—The deaths in London in a million of the population vary from 350 to 2130, and average 900. The fluctuations from year to year are considerable, and *the rate of mortality* in different years has varied in the following proportions: 1, 2, 3, 6, 10, 16, and 25 per cent.

LAWS OF INFECTION.—The disease spreads by contagion and through the air; its infecting distance is considerable; it lingers in the same place longer than other infectious diseases; it rarely attacks the same person more than once, but may occur a second and even a third time; it may be communicated by inoculation of the contents of the vesicles which are sometimes blended with the rash; it is thought to be communicable before the appearance of the rash, and for as much as three weeks after its disappearance. It prevails constantly.

PERIOD OF INCUBATION.—From a few hours, or two or three days, to ten days or a fortnight. It is sometimes stated to be five days.

DIAGNOSIS. — Scarlatina may co-exist with *Enteric fever*. *From measles* it is distinguished by the absence of cough, sneezing, and coryza; by the affection of the throat; by the peculiar appearance of the tongue; by the brighter hue and greater extent and less-defined form of the eruption; by the occurrence of the rash in most cases on the second instead of on the fourth day. The great frequency of the pulse and the high temperature of the skin are also highly characteristic of scarlet fever, as are secondary dropsy, affections of the joints, and mortifications. From most cutaneous disorders by the extent of the eruption, the sore throat, and the fever. A supposed hybrid of scarlet fever and measles has been described under the term *Rötheln*. It is scarlatina *plus* cough, hoarseness, and lachrymation; symptoms which assimilate the disease to measles, but which are due to the presence of scarlatinal eruption on the mucous membranes. The eruption on the skin is usually excessive in this form of the disease.

Some cases of scarlatina which soon lapse into profound coma may be mistaken for narcotic poisoning, but the skin in such cases of fever is usually as red as, or even redder than, a boiled lobster.

For the distinction between Scarlatina and Diphtheria, see Diphtheria.

PROGNOSIS.—*Favourable symptoms*. The concomitant fever purely inflammatory, and slight affection of the throat; remission of the febrile symptoms, and of the affection of the throat, upon the appearance of the eruption; epistaxis; diarrhœa; or other critical discharge. [In one case, I have known all the threatening symptoms pass away, after a profuse discharge of mucus from the nostrils (G.).] *Unfavourable symptoms*. Early nausea and vomiting; the fauces of a dark-red or purple colour, without swelling; ash-coloured or brown specks, soon becoming ulcerated, or terminating in gangrene (*cynanche maligna*); a brown tongue; great prostration of strength; early occurrence of delirium; coma; high fever after the period of desquamation; dyspnœa, and stridulous voice, indicating the extension of the disease to the larynx and trachea; acute pain in the ear, with deafness and purulent discharge; acrid discharge from the nose; obstinate dryness of the skin; a fresh efflorescence and increase of fever; a sudden disappearance of the rash, or a livid hue. The pregnant, and especially the puerperal state, and teething.

A favourable convalescence may be expected when the pulse falls much below its natural frequency in health; and a marked improvement is generally indicated by a fall of the pulse at night as compared with its frequency in the morning. A frequent pulse continuing when the urgent symptoms have subsided would lead us to anticipate a lingering convalescence or the occurrence of secondary symptoms. (G.)

TREATMENT.—A moderate and equable temperature, about 60° Fahr.; a clean and spacious apartment; a light diet without animal food; cooling acidulated liquors for common drink, and the saline draught as medicine; gentle aperients, more particularly towards the decline of the eruption. The treatment may be advantageously commenced with an emetic (Form. 220), followed by a saline aperient, or by a full dose of castor-oil.

If the constitution be robust and there be much fever, we may administer nauseating doses of tartar emetic during the first twenty-four hours.

When the heat of the body is great, and persistent, and the skin dry, the patient should be immersed for ten minutes in a hot bath, and saline diaphoretics given.

When severe inflammation of the throat is present, with much external tenderness, and great difficulty in swallowing, from six to twelve leeches may be applied to the angle of the jaw, followed by a large warm bread-and-water poultice, and repeated if necessary. In milder cases a bread-and-mustard poultice, or stimulating infrictions, applied to the same part, are necessary. A strong solution (5 grs. to ʒi.) of nitrate of silver should be applied twice a day to the inflamed fauces. Acidulated gargles (such as the compound infusion of roses with an excess of acid) may be used to clear the throat; and if the discharge be offensive, gargles of chlorine or permanganate of potash will be required. The following is a very useful form:—Dissolve ʒii of chlorate of potash in an ounce of water, add ʒss. of hydrochloric acid, and afterwards water to ℥vi. This gargle may be swallowed. At this stage of the disease the patient's failing strength often requires the use of 4 or 6 oz. of wine daily. The diaphoretics should be persevered with.

At the decline of the eruption tonics are required, of which quinine is the best; and a nutritious diet with wine, in moderate quantity. But if the skin continue dry and hot during desquamation, we must induce sweat by the appropriate means. For a full fortnight after desquamation the patient should be kept warm in the house, unless the external air be dry and mild. A sudden chill arrests the action of the skin and leads to congestion of the kidneys. About the time when desquamation sets in a little albumen is generally contained in the urine, and disappears after a day or two. If it persist and increase, we must resort to the hot bath, and keep the patient in bed. Scarlatina, which assumes at any part of its course the typhous character, is highly dangerous, and requires the employment of tonics, such as mineral acids, combined with quinine or bark, and stimulants in large and repeated doses, as recommended in typhus fever. When the throat is covered with sloughs, stimulating and disinfecting gargles must be used very often; and strong solution of nitrate of silver should be frequently applied to the throat.

Chlorate of potash (a drachm to a pint of water) may be taken as a drink in cases of severe scarlet fever; or it may be taken with hydrochloric acid in the proportions recommended for the gargle, and in ℥ss. doses.

Complications must be treated on ordinary principles, according to the severity of the inflammation and the existing state of system. Swelling of the joints is best treated by hot fomentations. Dropsy, following scarlatina, must be treated in the usual way. (See Dropsy and Renal Diseases.)

Proper aperients, tonics, nutritious diet, warm clothing, and cautious avoidance of exposure to cold or damp, must be employed and observed after recovery from this disease.

PROPHYLAXIS.—As the disease is highly contagious, the same precautions are required to prevent it from spreading as are recommended in typhus fever. (See p. 294; see also the precautions given under "Nursing," p. 254.)

DIPHTHERIA—DIPHTHERITIS.

DEFINITION.—A contagious and infectious disease, manifested by inflammation of the commencement of the alimentary and respiratory passages, and accompanied by fibrinous exsudation.

SYMPTOMS.—The disease invades the system most insidiously, and it may be fully developed when the patient is still unconscious of any affection of the throat. Generally, however, a little stiffness of the neck, soreness of the throat, and slight difficulty of deglutition, are complained of, and, on inquiry, we may learn that the patient has been feeling a little weak and out of sorts for two or three days. Sometimes there is considerable constitutional disorder, indicated by chilliness, nausea, and diarrhœa, with mental depression and bodily weakness. The skin may be hot and dry, or cool and bathed in perspiration, or natural. The pulse varies accordingly. On examining the back of the mouth, the isthmus of the fauces and tonsils, altogether or in part, are seen to be swollen and of a dark claret colour, and, sooner or later (in from twelve to forty-eight hours from the commencement of throat affection), a smooth, tough, yellowish-grey, thickish layer of lymph, resembling wetted felt or washleather, is formed over a portion of the inflamed and dusky surface. Sometimes a tonsil is the primary seat of the exsudation, whence it spreads to other parts. Sometimes the soft palate or one of its arches is the starting-point. But it may first appear on any portion of the mucous membrane contiguous to these parts. Occasionally the exsudation makes its appearance simultaneously at several points. Wherever it appears it tends to enlarge, and may spread down the œsophagus into the stomach, or, what is more dangerous still, it may involve the mucous membrane of the larynx, and thence extend along the trachea into the bronchial tubes. In about three days the whole of the inflamed surface is covered with a thick layer of lymph. If there be any open ulcers on the skin, they are liable to become covered with diphtheritic exsudation. The exsudation is composed of tough fibrinous substance; rarely soft and pulpy: detached with some difficulty, and, when separated, exposing a smooth bleeding surface, on which the exsudation re-forms in a few hours. We know that the larynx is implicated by the change in the voice. It is rough and husky, or there may be simply aphonia, and the patient speaks in a whisper. The breathing may suddenly become croupy or stridulous, the face livid, the eyes prominent, the conjunctiva injected, and the supra-sternal and supra-clavicular depressions sucked inwards. Within a few hours from the accession of these symptoms the patient may die suffocated.

In proportion to the extent of the pharyngeal disease there is pain and difficulty in deglutition. In a later stage of the disease pain is absent, for the parts have lost their delicate sensation.

The mucous membrane of the nares participates in the disease, and there is a flux of thin muco-purulent matter like that which appears in bad forms of scarlatina, but so offensive that the whole atmosphere of the room is tainted by it. The breath has the same putrid odour.

In such grave cases prostration rapidly comes on, and the patient lies on his back apathetic, or insensible and muttering. The heart's action, which had been feeble, though excited, now begins to fail. The face is pallid, the pulse thready, and the patient dies of asthenia.

During the progress of the disease the urine will in a great many cases be found loaded with albumen.

The *duration of the disease* varies from forty-eight hours to fourteen days. Laryngeal symptoms are usually manifested early; and when the disease is fatal from implication of the larynx, the patient dies within a week. In the absence of laryngeal symptoms, death from athenia usually occurs during the second week.

Convalescence commences some time in the second week; but it may be deferred to the beginning of the third.

SEQUELÆ.—These are much to be dreaded. They are all attributable to defect or disorder of nervous power, of which the gravest indication is feebleness of the heart's action. At a time when convalescence appears to be established, and all things seem to be going on well, the heart may be losing force. Stimulants may be freely given, and yet its action becomes slower from day to day, until the pulsations are reduced to half their normal number, and, the depression still continuing, the patient quietly expires.

Sometimes the whole muscular system partakes of the debility which affects the heart: the muscles become too weak to support the body or to move the limbs; the patient cannot use his fingers to button a garment or write a letter. This is called paralysis: but is more properly termed excessive depression of nerve force.

More frequently the debility affects only the muscles of deglutition and vocalization; the fauces appear to have lost their sensibility; solids may be swallowed without much difficulty, but fluids are returned through the nose. The voice is weak, hoarse, and nasal. In rarer cases the special senses are affected, and there is blindness or deafness of one or other eye or ear. Disordered sensation, such as tingling in the hands or feet, is occasionally noticed.

These symptoms of disordered innervation may set in any time after convalescence, even up to six weeks from that event.

CAUSES.—*Predisposing.* Debility. *Exciting.* A poison, probably specific, either generated within the body or external to it ; spreading by contagion and infection, and affecting young persons and adults, but chiefly children. Old people are remarkably free from it. It occurs in epidemics separated by long intervals.

MORBID ANATOMY.—In death from laryngeal implication, fibrinous exsudations covering the mucous membrane of the larynx, the upper portion or the whole of the trachea, and in some cases the bronchial tubes to their second or third ramifications.

In the severe pharyngeal form the œsophagus and parts of the stomach may be found reddened and inflamed, or covered with diphtheritic exsudation. The inflamed mucous membrane and submucous tissue is thickened and harder than usual, and sometimes ulcerated ; the soft palate and tonsils may be gangrenous. Abscesses occasionally form in the cellular tissue surrounding the tonsils and pharynx. The cervical glands are enlarged and hard, and the areolar tissue in which they are imbedded infiltrated with serum. In death from asthenia we may find large fibrinous coagula in the heart or great vessels.

DIAGNOSIS.—*Quinsey* is distinguished by its being limited to the tonsils. We must distinguish between the yellowish spots of excretion from the inflamed gland and fibrinous exsudation. *Common sore throat* is unaccompanied by exsudation, and tends to ulceration. *Croup* is a local disease and restricted almost entirely to childhood, and unattended with symptoms of inflammation. Malignant *scarlatina* and diphtheria have so many resemblances, and so few differences, that satisfactory evidence of their being distinct diseases is wanting. The chief argument—and it is a strong one—in favour of their being distinct, is the fact that the one affords no protection against the other.

PROGNOSIS.—In no disease must our prognosis be more guarded. In the early stage we should offer none. If, after a week, there be no laryngeal symptoms, we may venture to predict convalescence. A robust patient will be less liable to secondary nervous affections than one of weakly habit.

TREATMENT.—*Constitutional.* In the absence of strong febrile symptoms, we must adopt the stimulant plan from the first. If the pulse be feeble, ammonia and bark should be given every four hours, and half a pint of wine or brandy and egg, well diluted, during the twenty-four hours, milk or beef-tea being administered in the intervals.

If the skin be hot, we should give diaphoretics to maintain it in a state of moderate perspiration. If it be cool and clammy, ♏xx—xxx of tincture of perchloride of iron in a wineglassful of water, or a moderate dose of quinine and acid, may be given thrice a day. Daily action of the bowels should be induced by means of saline aperients (Forms. 256, 264).

Local. Hot bread-and-mustard poultices to the throat. The application by means of a sponge or camel-hair brush of strong solution (gr. xl to ℥i) of nitrate of silver to the inflamed fauces night and morning. Solid nitrate of silver is liable to produce sloughing when applied to the mucous membrane in this low state of inflammation. The occasional use of the acid chlorine gargle (Form. 71), or of a solution of perchloride of iron (ʒvi of the tincture to ℥viii of water), if gargling can be effected without much distress. If laryngeal symptoms come on, inhalations of hot water simply, or a mixture of vinegar and water, will give much relief. A leech may be placed at once over either side of the cricoid cartilage. If we have reason to suppose that the exsudation is loosely attached to the mucous membrane of the larynx, we may give an emetic of sulphate of zinc. If suffocation be imminent, we should resort to tracheotomy; it may prolong life in many cases, and will save it in a few. If the exsudation affect the lower part of the trachea, little more than palliation can be expected from the operation.

The subsequent depression of vital power must be combated on general principles.

PESTIS—PLAGUE.

Definition.—A contagious fever, generally of the continued type, accompanied by an eruption of buboes, carbuncles, and petechiæ.

Symptoms.—The patient is attacked suddenly, or after slight premonitory rigors, with lassitude, depression, pain and weight of head, and giddiness, with an indescribable feeling of anxiety, and extreme restlessness and pain referred to the region of the heart. The countenance is expressive of exhaustion and anxiety, the eye is dull and sleepy, the eyelids closed, the mouth half open. The gait is staggering and uncertain, like that of a drunken man; the debility extreme; the head falls upon the breast; the eyes are dull and sunken, the complexion dusky. There is nausea, or bilious vomiting, often accompanied by diarrhœa; the urine is scanty, high-coloured, and sometimes bloody; the tongue is swollen, furred, and glistening, but moist and clean towards the tip and edges; pulse from 115 to 130, and very feeble; respiration hurried; speech indistinct and faltering. After twelve hours, there is usually some reaction, with insomnia and delirium; the eye assumes a peculiar brightness, and the pupil is dilated. The pulse is hard and full, or weak, fluttering, and intermittent; the tongue dry, parched, of a yellowish colour, red in the centre and at the edges, and becomes brown and cracked; the lips, teeth, and nostrils coated with dry sordes: there is intense thirst, and constant nausea, with occasional vomiting of a blackish fluid; the evacuations from the bowels dark and offensive, and occasionally mixed with grumous blood; and hæmorrhage sometimes takes place from the nose. On the second or third day, but sometimes much later, and sometimes as early as the first day, the characteristic external marks of the disease begin to show themselves. Darting pains in the axillæ, groins, or neck, indicate the commencement of the glandular swellings and carbuncles. In favourable cases, these swellings are bright red: in more dangerous ones, livid or purple.

In favourable cases, the crisis is by profuse perspiration and suppuration of the tumours, the patient beginning to mend from the sixth or eighth to the fourteenth or twentieth day. In unfavourable cases, the skin remains harsh and dry; the pulse is small and fluttering; low muttering delirium and laborious breathing set in; the eye is sunk, the countenance wears a ghastly expression; the skin becomes covered with petechiæ and vibices; the buboes remain stationary; the powers of life give way, the patient becomes comatose, and death takes place, commonly on the fourth or fifth day, without a struggle.

In the most favourable cases the patient can go about his usual avocations, though suffering from the swollen glands. In the worst cases, the patient never recovers from the first shock to the nervous system, but sinks within twenty-four hours, or as late as the second or third day, before the buboes have shown themselves.

The plague may be said to assume four degrees of severity: 1. Slight fever, without delirium, or buboes; 2. Fever, delirium, and buboes; 3. Fever, delirium or coma, buboes, carbuncles, and petechiæ; 4. Congestive fever, fatal on the first, second, or third day, before the appearance of buboes. The fever, though usually continued, may assume the intermittent or remittent type.

CAUSES. —*Predisposing.*— Poverty, filth, overcrowding, debility, disease, intemperance, adult age, female sex. *Exciting.*—Most probably those of enteric fever.

LAWS OF INFECTION.—Period of incubation, from a few hours to about twenty days. The disease is endemic in Egypt, often spreads to surrounding countries, and formerly prevailed in almost every part of Europe. An analogous disease is believed to exist in some parts of India. In common with other epidemics, plague attacks few persons at first, gradually attains its maximum intensity, and subsides as gradually. The rate of mortality is also greatest at the commencement of the epidemic, and at its first outbreak in each district.

MORTALITY.—At first, nine-tenths of the cases, or more; in the decline, a small proportion only. Throughout an epidemic, from one-third to two-thirds, or even four-fifths, of the persons attacked. A third, or nearly a half of the population of cities attacked by the plague is believed to have perished. In Smyrna, during five months of 1834, out of 5,727 persons attacked, 4,831 died: 1 in 23 of the whole population suffered, and about 1 in 27 died; 84 per cent. of the cases proving fatal.

PROGNOSIS.—Highly unfavourable, especially at the outbreak of the disease when the majority of cases end fatally: guarded even in mild cases.—*Favourable symptoms.* The early formation of firm and moveable buboes passing rapidly into suppuration; profuse perspiration; an absence of severe fever; life prolonged beyond eight days.—*Unfavourable symptoms.*—Subsidence of the buboes; suppression of urine; hæmaturia; petechiæ; obstinate vomiting; and all the symptoms which would be deemed unfavourable in continued fever. The puerperal state.

TREATMENT.—That of typhus fever, with warm poultices to the buboes and carbuncles, to promote suppuration, followed by prompt incisions. Salivation by mercury has been recommended, and, where it has taken place, seems to have been beneficial. The disease appears, however, to be almost equally fatal under all modes of treatment.

PROPHYLAXIS.—Separation from patients suffering under the disease; during the prevalence of the malady an unusually strict observance of all the laws of health. The avoidance of impure food and water. In the case of ships from infected places, a quarantine of twenty-one days; and if having cases of plague on board, twenty-one days from the recovery of the last case.

CHAPTER V.

FEBRIS HECTICA	Hectic Fever.
FEBRIS INFANTUM REMITTENS	Infantile Remittent Fever.
PYÆMIA	Pyogenic Fever.
FEBRIS PUERPERALES . . .	Puerperal Fevers.
CELLULITIS VENENATA . .	Dissection-wounds.
FARCINOMA.	Glanders.

FEBRIS HECTICA—HECTIC FEVER.

DEFINITION.—A remittent fever, arising from local irritation in a weakened constitution.

SYMPTOMS.—Chills, succeeded by flushes, terminating in a hot skin and frequent pulse, and these by perspiration, constitute the paroxysm of hectic fever. There are commonly two such paroxysms or exacerbations in the twenty-four hours. The first generally occurs about noon, and lasts four or five hours. After a short interval of freedom, a more violent exacerbation follows, which increases in violence till about two o'clock in the morning, when a perspiration, at first partial and then general, breaks out and resolves the paroxysm.

The pulse during the paroxysms is quick and frequent, ranging from 96 to 130, or more; the urine is high-coloured, and deposits a pink sediment; the cheeks wear a circumscribed crimson blush—the hectic flush; there is burning heat in the palms of the hands and soles of the feet. During the remission, the pulse is reduced in number, but seldom falls so low as in health. The appetite is not much impaired; and the tongue is clean, moist, and red. The patient rapidly loses flesh.

At length the paroxysms become more violent and the remissions shorter; the appetite fails; colliquative sweats alternate with diarrhœa; and under an increased severity of these symptoms, and of the disease which causes the hectic fever, the patient sinks.

DIAGNOSIS.—From idiopathic remittent fever by the pre-existence of local disease.

PROGNOSIS.—Favourable or unfavourable according to the nature of the local disease, of which the fever is the effect and symptom.

CAUSES.—This fever generally arises from the formation of pus, as in suppuration of the lungs, liver, hip-joint, &c. But it may arise from any local irritation in weakened constitutions, even when no suppuration exists. The infantile fever which arises from irritation of the alimentary canal is but one form of hectic. It is in advanced stages of consumption and in extensive suppurative disease of joints that hectic fever is developed in its most characteristic form.

TREATMENT.—This must depend on the disease of which the hectic fever is symptomatic. When there is no apparent disease to produce the hectic symptoms, the treatment must be that of debility, and the sulphate of quina will be the appropriate remedy.

FEBRIS INFANTUM REMITTENS—INFANTILE REMITTENT FEVER.

SYNONYMS.—Infantile gastric remittent — infantile hectic — worm fever—mesenteric fever—stomach fever—low fever of children—marasmus.

DEFINITION.—A non-specific fever due to gastro-intestinal irritation, resulting from retention of fæces, or vitiated condition of the bile or other digestive secretions.

SYMPTOMS.—Pallor, languor, drowsiness, and chilliness in the morning; flushed cheek, hot skin, restlessness, and feverishness towards evening, followed at night by profuse sweating, and towards morning by a distinct remission. Skin dry; tongue moist, but coated; pulse frequent; appetite variable and capricious, or altogether wanting; urine scanty; bowels costive or relaxed, or both alternately; the evacuations slimy and sour-smelling, or highly offensive, dark, green, pitchy, or clay-coloured, or with an abundant secretion of bile; the abdomen tumid and often hot to the touch; the breath offensive; the skin extremely irritable, so that the child is constantly picking the nose, lips, corners of the eyes, fingers, and anus.

In less severe cases, the remittent character of the fever is less strongly marked; the chilliness and languor of the morning, and the febrile exacerbation of the evening, being very indistinct, and the child merely looking pale and listless, and losing appetite. The disease becomes chronic; symptoms of phthisis, tabes mesenterica, hydrocephalus, or enteric fever, now declare the presence of these diseases. The patient wastes rapidly, until the plump and rosy features of the child are changed to the meagre aspect of shrivelled old age. The more the child wastes away, the more restless and irritable does it become, till the last stage of debility arrives, when it dies from exhaustion, in a state of total unconsciousness, or with the mental faculties unimpaired to the last. The disease may occur at any age.

MORBID APPEARANCES.—Those of enteric fever. Enlargement, induration, or suppuration of the mesenteric glands. The results of inflammation in the brain or lungs.

CAUSE AND DIAGNOSIS.—Rose-coloured spots, a fissured tongue, loose ochre-coloured stools, or hæmorrhage, declare the presence of *en-*

teric fever. Coma, strabismus, and convulsions; distension in the veins of the scalp, and prominence of the fontanelle; and heat of the head, indicate the existence of *hydrocephalus* or *tubercular meningitis.* Enlargement and hardening of the abdomen declare *tubercular peritonitis* or *tabes mesenterica.* Hurried respiration and diarrhœa should excite suspicion of *pulmonary and abdominal phthisis.*

PROGNOSIS.—Favourable. When due to constipation or other simple derangement of the alimentary canal; or to a mild form of enteric fever. —*Unfavourable.* When the other diseases above specified are declared.

CAUSES.—*Predisposing.*—All causes of debility, such as bad air, want of exercise, confinement within doors, and improper or deficient food.—*Exciting.*—Irritation of the mucous membrane of the intestinal canal by constipation or improper diet; worms (the symptoms in this case are generally less strongly marked); diarrhœa; teething.

TREATMENT.—Having removed all cause of irritation from the stomach and bowels by means of castor oil or syrup of senna, the patient should be placed upon restricted diet.

As long as vomiting or diarrhœa is present, milk, milk-gruel, arrowroot, or broth should be prescribed. In the absence of diarrhœa, rice-milk, bread-pudding, and jellies may be given in addition. No animal food should be allowed. In infants a still stricter diet is often necessary, and the quantity as well as the quality of the food must be carefully regulated. The stomach is often very irritable, and rejects even the simplest farinaceous food. In such cases a table-spoonful of new milk from the cow should be given every half hour or hour. If acidity be present, a little lime-water, or carbonate of soda, may be combined with it. This treatment is often very effectual. The stomach wants rest, and the patient wastes because it is not allowed to rest; it rejects food in ordinary quantity, and will bear none in any quantity but that which is natural to it at that early age.

Having adopted these general measures, attention must now be directed to the cause of the disease. The alvine secretions should be carefully examined for *scybala*, for *defective secretion of bile*, for *worms*, and for *mucus*, each of which will point to the source of irritation.

The dislodgement of scybala must be carefully effected by means of castor oil and demulcent enemata.

If the secretions are defective, a cholagogue aperient (Form. 284) should be given every, or every other night; or a mercurial alterative (Form. 333) morning and evening. If worms are found to be the cause of the irritation, an anthelmintic (Form. 314 *et seq.*), according to the requirements of the case, should be given.

Diarrhœa and the discharge of mucus (enteritis, colitis), and other distinct affections of the abdominal viscera, require the treatment appropriate to these diseases.

PYÆMIA.

Synonyms.—Simple pyogenic fever (Jenner). Septicæmia (Vogel). Ichoræmia (Virchow). Purulent diathesis (Tessier). Suppurative phlebitis.

Definition.—Severe pyrexia, the result of an altered condition of the blood from admixture with pus or sanious fluid.

Symptoms.—These come on after parturition; wounds or blows, especially of bones; any local inflammation or ulceration; the infectious fevers, &c. They are initiated by severe rigors, followed by intense fever; pulse 100 to 140, full and hard; tongue dry and brown; severe muscular and articular pains; more or less delirium. If the foot have been the seat of operation or injury, deep-seated pain, followed by swelling and tenderness in the muscles of the calf, in the ankle, knee or hip-joints, or in all these parts in succession. There is usually more or less tenderness and swelling in the course of the main veins of the limb, and deep-seated fluctuations may be detected in the neighbouring muscles of the leg and thigh. The fever may now subside, leaving the patient very weak, and liable to hectic: or, as is more usual, the patient sinks into the typhous condition, and dies comatose. If the purulent infection spread from the head, severe symptoms of meningitis, encephalitis, and pleuro-pneumonia generally appear at an early stage; if from the upper extremity, pain and swelling of the muscles of the fore or upper arm, of the elbow, shoulder and sterno-clavicular joints, accompanied by phlegmonous inflammation, of the corresponding parts of the integument, and followed by deep-seated fluctuation.

Sometimes the disease is still more general, and all the large joints of the body become painful, tense, and fluctuating, at a time when the lungs are partially consolidated by inflammatory exsudation. In more fortunate cases the disease may be limited to a hand or a foot, where successive abscesses make their appearance.

Pathology.—If the exciting cause be in the lower extremity, diffuse abscesses form in the cellular tissue between the muscles, or in the muscles themselves. Inflammatory swelling and hardening of the areolar tissue around the coats of the main veins leading from the seat of injury, thickening of the coats of the veins themselves—in a word, symptoms of phlebitis. The affected veins are either obstructed with dark, firm coagula, or are filled with pus. The following is an example:—A patient had a bit of necrosed bone removed from the fifth metatarsal bone of the left foot, and two days afterwards symptoms of pyæmia appeared. He died on the twenty-first day; meanwhile the little wound made by the operation healed completely; the left iliac vein, and the left femoral vein, down to the ham, were filled with creamy pus, and the mouths of their tributaries were plugged with dark, clotted blood; the muscles of the calf were imbedded in a diffuse abscess.

If the intestines be the seat of lesion, inflammation, and numerous minute abscesses may be found in the liver. If the disease have sprung from necrosis of the bones of the internal ear, or from contusion of the bones of the cranium, we shall find the veins of the diploe full of pus; pus and other products of inflammation will be effused between the dura mater and the bone, between or beneath the membranes in the brain substance itself, and very commonly in the lungs. Purulent effusions are commonly found in the pleural and peritoneal sacs.

CAUSE.—1. The generation of pus within the circulatory system. 2. The absorption of pus or sanies from any suppurating surface. Since ulcers occasionally affect the inner surface of the heart and arteries, it follows that pus may be thus directly discharged from them into the blood. Whether the blood itself, in the absence of any external exciting cause, be liable to suppuration, has not been proved; but, on the other hand, we have no proof that it possesses any immunity from spontaneous purulent degeneration. The evidence of such blood disease can never be great, since life must necessarily terminate before any considerable portion of the blood could be thus affected.

With regard to the absorption of pus, this may take place directly, the pus being derived either from the inflamed inner surface of the divided vein, whose open extremity communicates with the suppurating surface, or, in the absence of inflammation, by the capillary action of the empty portion of that vein. In the former case the pus is the result of inflammation of the vein, which, from contiguity, participates in the general inflammation of the part. Such is the simple and obvious cause of pyæmia. This cause, and even the fact of pus in the blood itself, has been denied. But pus in the iliac and femoral veins, caused by a wound in the toe, as in the case just cited, is the completest proof possible of the existence of morphological pyæmia.

White blood cells and pus corpuscles resemble each other too closely to be easily distinguished; hence, when white cells are found in abnormal quantity in the blood, our only means of diagnosis are the conditions which have preceded their formation. If the patient have died of anæmia, associated or not with some non-inflammatory disease of the spleen or lymphatic glands, we attribute the formation of an unusual number of white cells to leucæmia; if pyogenic fever have been present, to pyæmia.

PROGNOSIS.—Very *unfavourable* when the disease comes on after amputation or infectious fever; *favourable* in proportion as the fever diminishes, the internal organs escape, and the disease localises itself in the limbs, or muscles and integument of the trunk.

TREATMENT.—*General.*—That recommended for the later stage of typhus fever; we must produce sleep and alleviation of pain by large doses of opium. Quinine with acid may be given in large doses in the early stage. *Local.*—Leeches and cold affusions to the head if necessary; hot fomentations and poultices to inflamed places; free incisions wherever fluctuation can be detected.

FEBRES PUERPERALES—PUERPERAL FEVERS.

Under this designation authors have described several forms of disease, differing in many of their characters, but agreeing in the general feature of combining a well-marked febrile affection with a local disease varying in seat, character, and intensity. The following distinct forms are recognised :—

1. ACUTE PUERPERAL PERITONITIS.
2. ADYNAMIC, OR MALIGNANT PUERPERAL FEVER.
3. PUERPERAL INTESTINAL IRRITATION.
4. FALSE PUERPERAL PERITONITIS.
5. MILK FEVER.

GENERAL REMARKS ON PUERPERAL FEVER.

The diseases usually characterised as Puerperal Fever, are the first two of this group—*acute puerperal peritonitis*, and *adynamic or malignant puerperal fever*. Both these have been observed in different epidemics; and cases of both forms occur in the same epidemic. These two forms, and all their varieties, have their origin in the same cause, and that cause is *uterine phlebitis*, the result most probably of the passage of sanious or purulent fluid from the uterine cavity into the uterine circulation. If the uterus remain large and tender, and the discharges offensive, we may apprehend the accession of puerperal fever in some form or other. The local lesions of puerperal fever involve one or all of the organs of gestation. Most commonly the disease spreads from the peritoneal covering of the uterus. In other cases, its muscular walls are the seat of abscess, softening, and gangrene. In others, the lining membrane is softened and gangrenous, and the open mouths of the veins exsude putrid sanies. The veins and lymphatics are inflamed. and either blocked up with clots or distended with pus. Diffuse pelvic cellulitis, resulting in large purulent collections, is not uncommon. Inflammation and suppuration of the ovaries are among the local lesions. Purulent deposits in the muscles, joints, and phlegmasia dolens, arise as secondary affections.

There can be no doubt that some local lesion, sometimes not very severe, will be found on careful examination in every case of fatal puerperal fever, and to this it is reasonable to attribute the fever. But some observers hold a different opinion, viz., that there is a specific poison which generates the fever, and that the local lesions are its secondary results. Puerperal fever is indeed highly contagious, and repeated experience has proved that a practitioner may, after the strictest precautions, carry the disease from patient to patient in uninterrupted succession. The experience of lying-in hospitals is also corroborative of the highly contagious, if not infectious nature of puerperal fever. At first sight, therefore, we may conclude that there is a *specific* poison: but further experience dissuades from this view, for it has been observed that the common post-mortem poison and erysipelas will in like manner produce puerperal fever. The true explanation appears to be this: that just as diastase will bring about an immediate conversion of starch into sugar, so will a particular condition of the animal fluids induce a suppurative change in the tissues. While this theory will serve to account for the production of puerperal fever, it will be useful in indicating the precautions which medical practitioners should use in attending parturient women. They must avoid contact with erysipelas, post-mortem fluids, and putrid discharges of all kinds; and if they have been obliged to handle them, the hands should be washed several times in a running stream, and several times soaked in a solution of kreasote or carbolic acid.

1. ACUTE PUERPERAL PERITONITIS.

SYMPTOMS.—Severe rigor, commencing from the second to the fourth day after delivery, and in some cases much later; followed by acute pain in the abdomen, and generally in the hypogastric region: the uterus is enlarged, and very tender. The pain is constant, augmented at intervals, increased by pressure and motion, and accompanied by fulness and tension of the abdomen. The secretions, especially the milk and lochia, are checked, and if the latter continue it is very offensive; the skin is hot; the pulse either frequent, small, and wiry, or full and bounding; the tongue furred. There is headache, restlessness, and sleeplessness, with pinched, anxious, and suffused countenance, occasional vomiting, and hurried respiration. In unfavourable cases, the pain and tension of the abdomen increase, and it feels hard and tympanitic; the pulse becomes more and more rapid, the skin cold and clammy, the head first feels confused, and then muttering delirium follows; the tongue becomes dry and brown, the teeth covered with sordes; distressing eructation and vomiting, hiccough, subsultus tendinum, facies hippocratica, and cold extremities, usher in the fatal result.

MORBID APPEARANCES.—Redness of the peritoneum, especially of that covering the uterus and its appendages, with more or less effusion of solid lymph and serum into its cavity. The uterus, ovaries, and Fallopian tubes covered with a creamy matter. Purulent deposits sometimes found in the muscular structure of the uterus; ovaries often disorganised by abscess.

CAUSES.—Contagion. The common causes of inflammation. It is often epidemic, and coexists with or precedes the malignant variety.

PROGNOSIS.—*Favourable*, but guarded, if the treatment be commenced early, and if the reigning epidemic be of a mild character.

TREATMENT.—*General.* Leeches to the abdomen in number according to the severity of the symptoms and the strength of the patient; hot fomentations; calomel in doses of half a grain, in combination with half a grain of opium, or with five grains of Dover's powder, every two, three, or four hours, continued till the constitutional effects of mercury are produced. Cooling drinks and cool air. Nourishing food and stimulants, as wine, brandy, and ammonia, or turpentine, taken by the mouth, and in the form of injection.

Local.—The uterine cavity should be thoroughly washed out with warm water containing $\frac{1}{20}$ part of an aqueous solution of carbolic acid or kreasote. A purgative of castor-oil, or salts and senna, to be administered at the outset, and if swelling, tension, and tenderness of the abdomen continue after the antiphlogistic remedies have been carried to their full extent, turpentine stupes or a blister may be applied to the abdomen.

2. ADYNAMIC, OR MALIGNANT PUERPERAL FEVER.

SYNONYM.—Puerperal hysteritis or metritis.

SYMPTOMS.—More obscure than the foregoing: the rigor less strongly marked, the pain in the abdomen less severe, little increased by pressure, deep-seated, more circumscribed, and often limited to the hypogastric or iliac regions. The pulse, from the first, extremely small, rapid, and weak, ranging from 130 to 160; countenance anxious and sunk, skin of a livid yellow tinge; extreme restlessness; intellect, though sometimes clear to the last, generally wandering; low, muttering delirium; tongue at first white, then dirty yellow, then dry and brown; if blood be taken, its colour is dark, and the coagulum very loose; eructation, vomiting, hiccup, diarrhœa; the evacuations highly offensive; lochial discharges fœtid and often suppressed; breasts flaccid; abdomen tumid and tympanitic; uterus large, uncontracted, tender. Death after the usual typhous symptoms, or slow recovery.

MORBID APPEARANCES.—Peritoneum of a dusky colour, the effused fluid dirty brown, often bloody and mixed with shreds of lymph. Fœtid gas in the intestines. Uterus disorganised, softened, or gangrenous; ovaries reduced to a pulp. Pus in the veins of the uterus, and in the joints; inflammation, and abscess of the cellular membrane of the leg, &c. In a word, evidences of pyæmia.

CAUSES.—Uterine phlebitis. Contagion.

PROGNOSIS.—*Unfavourable* in all cases.

TREATMENT.—The general and local treatment will be that recommended for the peritoneal variety of the disease.

The source of the mischief lies in the uterus, and we must attack it there by repeatedly washing out the offensive discharge by warm disinfecting fluids. The condition of the uterus should be carefully regarded for the first few days after delivery, and if it remain large and tender, and the discharges become offensive, we should lose no time in clearing out the disorganized clots which give rise to the fœtid discharge, and the absorption of which is poisoning the blood. Warm water may be injected from time to time into the rectum.

3. PUERPERAL INTESTINAL IRRITATION.

SYMPTOMS.—General uneasiness, coming on at any period after delivery, if the bowels have been neglected; loss of appetite; tongue furred; chills alternating with flushes; headache; frequent pulse; abdomen large and rather tense; slight, deep-seated pain, relieved by steady pressure; nausea and vomiting of a dark and offensive fluid; diarrhœa; evacuations dark, fœtid, watery, or slimy; flatulence; fœtor of breath. In unfavourable cases there is extreme debility and despondency; the red tongue of acute gastric irritation; and often an aphthous condition of the tongue and mouth. The diarrhœa continuing and the strength diminishing, the febrile symptoms become more constant and severe, and the patient passes into the typhous state.

MORBID APPEARANCES.—Generally none. Sometimes inflammation, with or without ulceration, of the mucous membrane of the intestines.

PROGNOSIS.—More favourable than either of the preceding varieties.

TREATMENT.—At first a full dose of calomel and opium, in order to relieve the intestines of retained or offensive matters. If diarrhœa continue, it should be kept in check by means of sulphuric acid, bismuth, or copper (Forms. 85, 151, 173). If need be, the calomel and opium may be repeated, or a dose of castor-oil in place of it. The local and dietary treatment should be that of enteric fever.

4. PUERPERAL PERITONEAL IRRITATION.

SYMPTOMS.—After a slight rigor, pain and tenderness of the abdomen, a slightly-coated tongue, a rapid and very compressible pulse; temperature of the skin little increased. It is most apt to occur in delicate and nervous females, after unusually severe after-pains, or from the violent operation of a purgative. Profuse perspiration and diarrhœa are present in some cases.

PROGNOSIS.—Favourable.

DIAGNOSIS.—From true puerperal peritonitis by the milder character of the symptoms.

TREATMENT.—Fomentations, poultices, diaphoretics, and opiates, with an occasional mild laxative. Ten grains of Dover's powder, or from 20 to 30 drops of laudanum, may be given at once, and repeated at certain intervals if necessary.

5. MILK FEVER.

SYMPTOMS.—About the third day after delivery a well-marked rigor, followed by a hot and then a sweating stage; great pain and throbbing in the head; intolerance of light and sound; flushed countenance; contracted pupils; conjunctiva injected; pulse frequent, full, and hard; skin hot and dry; thirst excessive; tongue dry and coated; breasts hot, tense, and painful. If speedy relief be not obtained, the head symptoms become more severe, and may be attended by slight delirium; the breasts become hard and more painful, and the operation of suckling cannot be borne, and, after an increase of the general pyrexia, local inflammation sets in, followed by abscess of the breasts.

Causes.—Accumulation and retention of the lacteal secretion from want of early suckling, hyperæmia, &c.

Diagnosis.—From other puerperal fevers by the local affection.

Treatment.—Free saline purgation, by which the tension of the breast will be much relieved. The breasts should be kept cool by means of an evaporating lotion, or they may be gently rubbed with linimentum belladonnæ. The infant or a breast-pump should be applied to the nipples as soon as they can be borne. If we fail to subdue the congestion of the breast, we should apply a few leeches and use the ordinary means for preventing a mammary abscess.

CELLULITIS VENENATA—DISSECTION WOUNDS.

Definition.—Inflammation of the cellular tissue, accompanied by severe febrile symptoms, produced by a poison contained in certain dead bodies, and absorbed from wounds.

The wound may be received in dissecting, or may exist previously; but in some cases there has been no wound or injury of any kind.

Symptoms.—In most cases the disease sets in, within a few hours of the accident, with inflammation at the seat of the puncture; but in rare instances the local affection is preceded by febrile symptoms, ushered in by severe rigors. The inflammation commencing in the puncture first affects the hand, then gradually extends up the arm till it reaches the axilla, whence it sometimes extends to the trunk, and even to the lower extremity. It is accompanied by swelling, tension, and throbbing pain in the parts affected; the course of the absorbent vessels is often indicated by dusky red lines, or by an erythematous blush, with irregularly defined outline, and the absorbent glands above the elbow and in the axilla are swelled and painful. The inflamed parts are at first exquisitely painful, but become less sensitive as the disease advances. In favourable cases the inflammation terminates in serous effusion, which is gradually absorbed. In more severe cases suppuration of the cellular tissue, both superficial and deep-seated, occurs, and abscesses form under the theca of the punctured finger, or diffused abscess attacks the cellular membrane on the hand and arm, or even on the trunk of the body. When the inflammation runs very high, it sometimes terminates in extensive sloughs. In some of the least favourable cases the local affection is very slight. The punctured part becomes the seat of a small vesicle or pustule, and the inflammation at once attacks the axillary glands; the neck and upper part of the chest are swollen, stiff, and painful; and the inflammation sometimes extends over the trunk till it even reaches the lower extremities. Occasionally deep-seated diffused abscesses form without any superficial inflammation. The febrile symptoms often assume the typhous character, with profuse fœtid sweats, great debility, extreme depression of spirits, and high nervous excitement. The mind is generally unaffected; but the patient sleeps little, and is sometimes delirious at night. Recovery is often slow and imperfect, the hand remaining stiff in consequence of the slow absorption of effused fluids, the thickening of the textures, or the injury attending on suppuration or gangrene of the parts. Health returns but slowly.

CAUSE.—A contagious matter absorbed, in most instances, from a sore or wound on the hand, in persons handling animal matter in the first stage of decomposition.

DIAGNOSIS.—The diagnosis is difficult in those rare cases in which no punctured wound or other injury can be discovered. The acute sensibility of the inflamed parts is very characteristic.

PROGNOSIS.—The mortality in the more severe class of cases is about 50 per cent. *Favourable symptoms.*—Localization of the inflammation in the cellular tissue, and, at the worst, axillary abscess. *Unfavourable symptoms.*—Extension of the inflammation beyond the axilla and general pyæmia.

TREATMENT.—When local inflammation runs high, leeches may be applied to the inflamed part, followed by warm fomentations. When suppuration is taking place, warm poultices or fomentations should be kept constantly applied. Pus when formed should be discharged by free and deep incisions.

The patient's strength will generally require to be supported by stimulants, such as ammonia and æther, with a liberal supply of wine and a nourishing diet.

If there should be acute pain and great excitement, full doses of opium or of its preparations should be given; such as half a drachm of tincture of opium, or half a grain of muriate of morphia, combined with ammonia or æther when the symptoms assume the typhous character.

Free action of the bowels must be secured by the occasional administration of aperients.

PROPHYLAXIS.—Wounds received in dissection, especially of bodies recently dead, should be immediately washed, and the wounded finger or part strongly sucked for a few minutes. On the appearance of the least inflammation a poultice should be resorted to. The application of caustic to the wound may do good if applied at once to the bottom of the puncture.

FARCINOMA—GLANDERS—FARCY.

SYNONYM.—Equinia.

DEFINITION.—A contagious malady, characterised by inflammation of the nasal mucous membrane, and by inflammatory tumours and pustules in different parts of the body, caused by contact with the horse or other quadruped affected by glanders, or with persons suffering from the same disease.

VARIETIES.—1. Acute glanders. 2. Chronic glanders.

1. *Acute Glanders.*

SYMPTOMS.—The disease generally sets in with pain in the head, back, and limbs, rigors, nausea, thirst, great prostration of strength, and stiffness and pain in the joints, increased by motion. These symptoms are followed, after a short but variable interval, by tumours, red, painful, and tender, in different parts of the body, terminating in abscesses discharging a fœtid sanies, and passing quickly into gangrene. From the fourth to the sixteenth day a profuse discharge of a yellow or sanious fluid from the nostrils sets in, accompanied by redness, heat, swelling, and excoriation of the nose, lips, and cheeks; the eyes are inflamed, and the eyelids swollen. Pustules and black bullæ appear on the face, trunk, limbs, and parts of generation. These local symptoms are accompanied by a hot skin, urgent thirst, frequent, weak, and irregular pulse, and feeble respiration. The tongue is covered with a dark fur; the skin is bathed in a profuse and offensive perspiration; the evacuations are slimy and fœtid. These symptoms increase in severity, and are followed, after a few days, by diffused abscesses in different parts of the body, especially about the joints; typhous symptoms rapidly supervene; the nose and lips become gangrenous; the discharges extremely offensive; low muttering delirium sets in, and death takes place by collapse. The greater number of patients die within a fortnight; few survive till the third or fourth week. One death is reported at the end of more than two months.

ANATOMICAL CHARACTERS.—Besides the superficial pustules and tumours, congestion of the mucous membrane of the nose, fauces, air-passages, and alimentary canal; congestion of the lungs; phlebitis; purulent deposits in the lungs and joints; diffused abscess in the cellular membrane; and bloody fluid in the serous cavities.

CAUSES.—Contagion and infection. The disease originates in quadrupeds from over-work, privation, or overcrowding, and is most commonly communicated from the horse to the human subject.

DIAGNOSIS.—The peculiar discharge from the nostrils, the seat and character of the pustules, the history of the case, and the occupation of the patient, prevent this from being confounded with any other disease. Farcy is distinguished from glanders by the absence of the peculiar discharge from the nostrils. But the two terms, Glanders and Farcy, are not used with much discrimination, at least in the human subject. Farcy, as it occurs in the horse, is distinguished as *button-farcy* and *bud-farcy*, according as the tumours attack the cellular tissue in common with the lymphatic glands, or the lymphatic glands only.

PROGNOSIS.—In acute glanders highly unfavourable. The disease is generally and speedily fatal. In chronic glanders more favourable. In farcy still more favourable.

TREATMENT.—No remedy has yet been discovered. The treatment must be that of typhus fever. The treatment of the local inflammation the same as in cases of dissection wound.

PROPHYLAXIS.—Those who are employed in grooming horses affected by glanders should wear gloves, avoid contact with the diseased animal, and practise scrupulous cleanliness. Wounds or sores in grooms should, like dissection wounds, be promptly treated by suction. Stables in which glandered horses have been kept should be thoroughly cleaned and fumigated, scraped and whitewashed, and harness and horsecloths either destroyed or exposed to a high temperature, and thoroughly washed. Carbolic acid should be freely employed.

2. *Chronic Glanders.*—In this form of the disease the local symptoms precede the febrile excitement, and the course of the malady more nearly resembles the effects of a dissection wound. After a few hours from the introduction of the poison, the lymphatics of the wounded part become inflamed, and the inflammation extends along the fore-arm and arm to the axilla. The parotid and submaxillary glands may also be swollen and inflamed. Extensive abscesses form in the cellular tissue of the limb, and, in fatal cases, the pustular eruption, accompanied by dark bullæ, appears on the skin, followed by well-marked hectic fever. The duration of the fever is often very considerable, both in favourable and in fatal cases.

The term chronic glanders is used as synonymous with acute farcy; chronic farcy being a still milder and more protracted disease.

CHAPTER VI.

Scrofula	King's Evil.
Rachitis	Rickets.
Mollities Ossium . . .	Softening of the bones.
Purpura	Scurvy.
Rheumatismus	Rheumatism.
Podagra	Gout.

SCROFULA OR STRUMA—KING'S EVIL.

Definition.—The deposit of *tubercle* in several organs of the body, and a tendency to indolent inflammatory swellings and chronic ulcers.

The most common forms of scrofulous disease are, chronic inflammation and suppuration of the glands of the neck, strumous ophthalmia, and chronic ulcers of the cornea, indolent abscesses of the skin, enlarged tonsils, mollities ossium, diseases of the bones and joints, psoas abscess, tabes mesenterica, and pulmonary consumption. The scrofulous, too, are more subject than others to hysteria and to mental disorders.

The form of scrofula to be described in this place is that which attacks the absorbent glands of the neck. Other scrofulous affections will be considered in these pages under Rachitis, Tabes Mesenterica, Phthisis Pulmonalis, and Strumous Ophthalmia.

Symptoms.—The scrofulous constitution is indicated by a lax habit of body, a thin fair skin, delicate rosy complexion, fair and fine hair, full upper lip, and tumid septum and alæ nasi. It is also apt to attack spare, pale children, with projecting foreheads, misshapen heads, narrow and deformed chests, swollen fingers, enlarged joints, irregular and unsound teeth, and tumid abdomens. In addition to these marks of the scrofulous diathesis, may be mentioned a languid circulation, a slow and weak pulse, cold extremities, and great liability to chilblains. A weak digestion, variable appetite, and torpid, or disordered, bowels are also of frequent occurrence in scrofulous children. The subjects of this disease often display great acuteness and aptitude, with lively imaginations, and ardent affections, and not unfrequently a great precocity of intellect.

The scrofulous affection of the glands of the neck first appears as a slight swelling of one or more of the glands of one or both sides, especially of those situate beneath the lower jaw. The tumour is even to the touch, moveable, not tender, nor marked by any inflammation of the skin. Sometimes the swollen gland or glands will remain in this state without perceptible change for weeks, months, or even years;

sometimes they undergo a very gradual enlargement; sometimes they coalesce, so as to form irregular knotty swellings; sometimes they gradually disappear. In a large proportion of cases they proceed to suppuration. Fluctuation is perceived, the tumour points, the skin gives way, and pus, followed by a sero-purulent, mixed with a curdy or cheesy matter, is discharged by one or more openings. The abscess thus formed heals slowly, has an unhealthy appearance, a dull-red colour, with hard, swollen, irregular edges, and an uneven base, clogged with curdy matter. After the ulcer has healed, an irregular and unsightly scar occupies its site. Though the superficial glands of the neck are those most frequently attacked, those deeper-seated are often implicated; and the disease sometimes spreads along the course of the absorbents from one gland to another.

The constitutional disturbance which accompanies these local changes is usually slight. The patient retains his colour, does not lose flesh, and has every appearance of good health. When the local disease, however, is very extensive, and the glands suppurate, hectic fever sets in, with great debility and emaciation. In advanced stages of the disease, especially in young adults, pulmonary consumption may supervene; and the two diseases then run on together until they destroy the patient.

Causes.—*Predisposing.* Hereditary taint; syphilis or gout, or a shattered constitution in one or other of the parents; disparity of age in the parents, or too near relationship; childhood, youth, and the early adult age. The disease is of most common occurrence between the third and seventh year; it is comparatively rare after puberty, but may occur as late as thirty years of age.—*Exciting.* All causes of debility acting on the predisposed—such as sedentary habits of life; scanty and unwholesome food; the impure air of crowded and ill-ventilated nurseries, schools, workshops, and factories, and the confined rooms inhabited by the poorer classes; overwork; damp and low situations; exhausting maladies, especially fever, and the febrile exanthemata. The immediate exciting cause is often an attack of catarrh. The disease is common among prisoners.

Diagnosis.—From simple glandular inflammation, by the indolent character of the swellings.

Prognosis.—The disease, when limited to the absorbent glands, is rarely fatal, but tabes mesenterica, white swelling of the joints, disease of the spine, and pulmonary consumption, are dangerous and fatal maladies. Scrofula is always slow and tedious in its course, and very uncertain in its duration.

Morbid Anatomy.—The glands contain a soft curdy matter. The other viscera, especially the mesenteric glands and the lungs, contain tubercular deposits. Scrofulous disease of the joints and bones is also of common occurrence.

Treatment.—A nutritious diet, adapted to the age of the patient, with a due allowance of animal food. Wine and malt liquors in moderate quantity may be given with advantage. In scrofulous infants brought up by hand, the substitution of the mother's milk, or of pure milk from the ass or cow. Daily exercise, short of fatigue. Warm clothing (flannel next the skin, avoiding over-clothing).

Change of air, especially from a low, damp situation to a high, dry, and bracing air. Sea-air and sea-bathing in the summer and autumn.

A cold or tepid bath daily, followed by friction with a rough towel, or the shower-bath once or twice a week; and gentle aperients administered at short intervals. A few grains of rhubarb, with small doses of hyd. c. cretâ may be given occasionally, followed by a tea or dessert-spoonful of castor-oil the following morning.

Chalybeate tonics, especially the tinctura ferri perchloridi, the ammonio-citrate, and the dried sulphate, or quinine and iron in combination, are suitable preparations.

Iodide of iron in doses of from one to five grains, three or four times a day, and cod-liver oil (a tea-spoonful three times a day, gradually increased to a table-spoonful) are valuable remedies in scrofula.

II. Simple enlargement of the glands of the neck may be treated by the constant application of the emplastrum ammoniaci c. hydrargyro, or they may be painted frequently with iodine paint. If the patient be at the sea-side, poultices of sea-weed (the *Fucus vesiculosus*) may be kept constantly applied. When suppuration takes place, it must be encouraged by poultices, and the matter be let out by a small vertical or oblique incision. Caustic should never be used for this purpose, as it causes unsightly scars.

Open scrofulous ulcers generally put on an indolent character, and must be treated by local stimulants, and in extreme cases by caustics. In the treatment of other local affections occurring in scrofulous habits this peculiarly indolent character must be borne in mind.

REMEDIES.—*Mercurial preparations given as alteratives,* such as Plummer's pill, or the perchloride of mercury (Form. 321). *Alkalies and alkaline earths,* of which the best is the liquor potassæ, in doses of from five to twenty drops, three times a-day in some tonic infusion; or lime-water in doses of from one to two drachms. *The mineral acids,* especially the nitro-muriatic acid. *The chlorides of Barium and of Calcium.* (Liquor barii chloridi, ♏iii to ♏v, cautiously increased; or Liquor calcii chloridi, ♏xxx to ♏xl, gradually increased.) *Extract of Conium.*

From the slow progress and uncertain march of scrofulous affections, many remedies seem serviceable which are really inert. In this respect scrofula resembles pulmonary consumption. The most opposite remedies are confidently recommended and deemed efficacious.

RACHITIS—RICKETS.

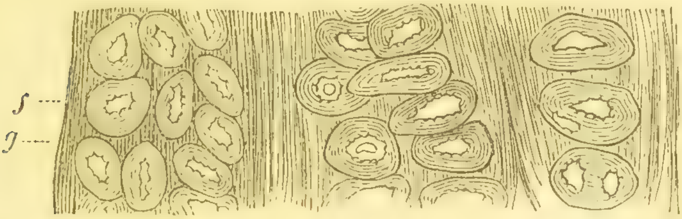
DEFINITION.—A distortion of the bones, occurring in infancy and childhood, from deficiency of earthy matters.

SYMPTOMS.—The disease sometimes begins soon after birth; more frequently when the child is five or six months old; more frequently still before the close of the second year. After this time it is very rare. When the disease first sets in, the child is observed to be less healthy and strong than children of the same age. The face is pale, and the body emaciated. Teething begins late, and goes on slowly, and the teeth soon become loose and carious. The fontanelles and sutures are usually open, the head, though smaller than usual, is generally large in proportion to the face, and the forehead prominent; the chest is flattened at the sides, and the sternum projecting, the epiphyses of the long bones become spongy, and the joints swell. This enlargement is commonly first perceived in the wrists and ankles. As the disease advances, the long bones yield to the weight of the body, and are twisted by the action of the muscles; the spine is curved and bent; and the pelvis distorted and narrowed. If the patient has begun to walk, his gait is unsteady and waddling. The mental faculties, except in cases of cretinism accompanied by distortion, are unimpaired, and even more acute than in children of the same age.

CAUSES.—*Predisposing.* Hereditary predisposition. A peculiar diathesis, allied to the scrofulous, but not identical with it; for neither enlargements of the cervical glands, nor tuberculous deposits in the lungs, are common in rickety subjects.—*Exciting.* Bad nursing, bad food, bad air, want of cleanliness.

PATHOLOGY.— Defective nourishment, or mal-assimilation of the food, leading to a deficiency of earthy matter in the bones. Dr. J. Davy found 100 parts of the dry tibia of a rickety child to be composed of 74 parts of animal matter and only 26 of earthy salts. The microscopic appearance of rachitic bone is very characteristic. Ossification is observed to have taken place so partially and imperfectly that the bone is made up of isolated and apparently independent masses of unaltered cartilage, and of completely and incompletely formed bone promiscuously distributed. Owing to the imperfect ossification of the matrix, the conversion of the enlarged cartilage cells into lacunæ is readily seen (Fig. 54).

Fig. 54.



PROGNOSIS AND RESULTS.—*Favourable.* The disease is very rarely fatal. In mild cases complete recovery often takes place; the swollen joints gradually returning to their natural size: in severe cases the distortion of the body is permanent, but the bones ultimately resume their normal composition, and even become more dense and compact than in persons originally healthy. Distortion of the pelvis causing obstruction to parturition is the only result which endangers life.

TREATMENT.—1. Food of good quality and adapted to the child's age is of the first consideration. If the mother is delicate and cannot nurse, or if the milk be poor, the child should be supplied with fresh milk from one cow. If this be not assimilated, a wet nurse may be provided. Dry and pure air, cold or tepid salt-bathing, and frequent frictions. Tonics, especially preparations of iron, such as steel-wine or the sulphate or potassio-tartrate of iron. Cod-liver oil may also be prescribed with advantage. Children living in large towns should be removed to the country. The state of the bowels should be carefully attended to. In order to supply the defective constituents phosphate of lime may be given in doses of from five to ten grains three times a day, suspended in chalk mixture. Preparations of iron may be given at the same time. If the child be very weak, phosphate of ammonia, in doses of from five to ten grains given three or four times a day, will be beneficial; milk and lime-water in equal parts form an appropriate drink.

2. The distorted limbs must be supported by such mechanical contrivances as do not interfere with the proper action of the muscles; and care should be taken not to allow the weight of the body to rest on those parts which show a tendency to swell or bend.

MOLLITIES OSSIUM—SOFTENING OF THE BONES.

SYNONYMS.—Osteo-malacia. Malacosteon. Atrophy of bone.

DEFINITION.—Perverted nutrition of the bones resulting in rapid absorption of the earthy matter and consequent softening.

SYMPTOMS.—The symptoms of this disease are very obscure, and its presence is rarely recognised till it has made considerable progress. Severe and long-continued pains in the pelvis and lower extremities, considered as rheumatic pains, have been present in the greater number of cases; but the disease is generally recognised for the first time by a fracture occurring in one of the bones of the extremities by the application of slight force; by the bending, twisting, or distortion of one or other of the limbs; or, in females, by the increasing difficulty of parturition, arising from a growing distortion of the pelvis.

ANATOMICAL CHARACTERS.—The cancelli of the bone completely absorbed, and the bone reduced to a mere shell, filled with medullary matter. The bones so softened as to admit of being cut with a knife. The periosteum sound. The teeth not implicated.

CAUSES.—*Predisposing.* The female sex. It is comparatively rare in men. The adult age.—*Exciting.* Obscure.

DIAGNOSIS.—From rachitis by the age of the patient; rachitis is a disease of infancy and childhood, mollities ossium of adult age.

PROGNOSIS.—Unfavourable. The disease often makes slow progress.

TREATMENT.—There is no remedy or mode of treatment on which reliance can be placed. The treatment must, therefore, be directed to the improvement of the general health, by nourishing diet, tonics, and such other medicines as are indicated by the existing state of the system.

PURPURA—SCURVY.

SYNONYMS.—Hæmorrhœa petechialis. Petechiæ sine febre.

VARIETIES.—1. *Purpura simplex ;* 2. *Purpura urticans ;* 3. *Purpura hæmorrhagica* (land-scurvy) ; 4. *Purpura nautica* (sea-scurvy).

1. PURPURA SIMPLEX.

SYMPTOMS.—After slight uneasiness, or giddiness, an eruption of small irregularly rounded patches, of a dark-claret colour, chiefly on the thighs and legs, but sometimes over the whole body. After a few days, the first patches begin to fade, and new ones appear. The skin readily bruises, and bleeding from even slight wounds is often controlled with difficulty. There is little disturbance of the general health. The disease may last from a few weeks to as many years.

PATHOLOGY.—Capillary hæmorrhage in the cutis occurring in isolated spots. Blood deficient in fibrine.

CAUSES.—*Predisposing.* Peculiarity of constitution, debility.—*Exciting.* Febrile states of system. It is often attributed to cold.

DIAGNOSIS.—By the shape and colour of the spots, and the uninjured cuticle.

PROGNOSIS.—Favourable.

TREATMENT.—A nourishing *mixed* diet, and proper exercise, astringent chalybeate tonics, the mineral acids, and occasional mild aperients.

2. PURPURA URTICANS

Is a form of urticaria, consisting in a discoloration of the patches of nettle-rash by blood poured out in small quantity into the cellular tissue. (See *Urticaria.*)

3. PURPURA HÆMORRHAGICA—LAND-SCURVY.

SYMPTOMS.—Weakness, lassitude, and pains in the limbs, with a feeble pulse of variable frequency ; petechiæ of larger extent than in the first variety ; occasionally bullæ filled with liquid blood ; gums swollen, livid, and spongy ; hæmorrhage from the gums, nostrils, uterus, and mucous membranes generally ; rigidity of the legs from effusion of blood into the texture of the muscles ; extensive bruises. In severe cases, all the symptoms of sea-scurvy.

PATHOLOGY.—A diseased condition of the blood ; with defect or excess of fibrine ; but in either case it is deficient in power of coagulating, and forms a loose, rotten clot. The albumen is said to be so far changed as to require a temperature 8° higher than usual for its coagulation.

CAUSES.—Those of sea-scurvy.

SEQUELÆ.—Ulceration of Peyer's patches. Shedding of the hair. Necrosis.

TREATMENT.—A generous mixed diet, with an allowance of wine or beer. Astringent tonics, chalybeates and acids (Forms. 163, 168). A table-spoonful of lemon-juice may be given with advantage three or four times a day.

PROPHYLAXIS.—Minute inquiries should be made as to the diet of the inmates of prisons and workhouses. It may not be deficient in quantity or in the quality of the articles of which it consists, but the essential element of vegetables containing an acid may be absent. For instance, scurvy has been traced in one case to the substitution of rice, which does not contain such an acid, for the potato, which does contain it; and the restoration of the potato sufficed to banish the disease. As the cheapest of requisite vegetables, the potato should always form part of the ordinary diet of prisons, workhouses, and hospitals.

4. PURPURA NAUTICA. SCORBUTUS—SEA-SCURVY.

SYMPTOMS.—Heaviness, weariness, dejection of spirits, aversion to exercise, dull pains in the limbs, especially during night; anxiety and oppression at the præcordia; palpitation and shortness of breath on the slightest exertion; a pale, sallow, and bloated countenance; the skin in some cases hot, in others cold and contracted; the pulse in some cases infrequent, in others small and frequent; the tongue clean, moist, and pale; the gums swollen, spongy, and livid, bleeding upon the slightest touch, and at length separating from the teeth, which become loose; the breath offensive; petechiæ appear on various parts of the body; the slightest scratch degenerates into a foul ulcer; the slightest pressure produces a bruise, and old cicatrices open afresh, and discharge a thin sanious fluid; spontaneous ulceration likewise takes place upon the gums and on the surface; the joints become swelled and stiff; the muscles of the legs, and of the calf especially, rigid, contracted, and exceedingly painful; the bowels are either obstinately constipated, or there is diarrhœa; the urine tinged with blood, or transparent, high-coloured, and acid. Great emaciation ensues; passive hæmorrhages take place from the gums, nose, and ears, from the stomach and bowels, and occasionally from the lungs and bladder; all the excretions become intolerably fœtid; but the appetite frequently remains good, the patient retains his intellectual faculties, and talks with a loud voice, but is apt to faint on the slightest motion. Many patients have expired as they were being carried from their hammocks. Sudden death has also often taken place in the earlier stage of the disease, during some violent effort.

Causes.—*Predisposing.* A cold moist atmosphere; sleeping in damp clothes or beds; the winter season; cold climates; fatigues and hardships; previous attacks of illness, especially of scurvy; indolence; depressing passions, and the general causes of debility; scanty supplies of water; deficient clothing; want of cleanliness; impure air.—*Exciting.* A diet restricted to a few articles of food, such as salt meat and biscuit; a deficiency of vegetable food, and especially of vegetable acids.

Diagnosis.—The absence of feverish symptoms, cerebral disturbance and contagion, together with its mode of access, distinguish this condition from fever and other diseases. Scurvy, as it formerly occurred on land, in besieged cities, in camps, and in monasteries, and occasionally among entire populations, and as it now shows itself from time to time in prisons and workhouses, is essentially the same disease as that which occurs at sea.

Prognosis. — Generally *favourable*, if the previous health and strength were good, and if a proper vegetable diet, or other proper substitute, can be obtained.—*Unfavourable.* Where there is great prostration of strength; extreme oppression at the præcordia; redness of the eyes and flushed countenance; a rapid weak pulse; profuse hæmorrhages; petechiæ of a dark-livid colour, and of great extent; fœtid and involuntary evacuations.

Treatment.—*Indications.* I. To supply what is wanting in the diet. II. To palliate urgent symptoms.

I. The first indication is fulfilled by fresh vegetables, or fruits, as the orange, the lime, and the lemon; fermented and fermenting spirituous liquors, as ale, cider, and spruce beer, and the light French and German wines, sauerkraut. Where great debility is present the stronger spirits may be given. At sea, ℥j of lemon or lime-juice should be served out daily to each individual.

Occasional aperients of infusion of tamarinds, cream of tartar, or the sulphates of soda and magnesia, may be given, and the utmost attention must be paid to cleanliness and ventilation.

II. *Ulceration of the gums* require astringent gargles of alum, muriatic acid, chloride of soda or of lime, or decoction of bark; or the steam of vinegar. *Acute pains* are relieved by opium; *oppression at the chest and difficulty of breathing*, by diffusible stimulants, such as nitric, sulphuric, or chloric æther with camphor; *contraction of the muscles of the legs*, by hot fomentations of vinegar and water, or emollient cataplasms, and by friction; *scorbutic ulcers* upon the surface of the body by slightly-stimulant applications.

The *hæmorrhagic tendency* and debility will be best combated by the free use of the mineral acid and chalybeate astringents.

Prophylaxis.—A due admixture with the food of fresh or preserved vegetables, or where these cannot be procured, lime-juice, lemon-juice, or citric acid. Also the acetate and bitartrate of potash. Among fresh vegetables, the potato and yam are the best. As a moist atmosphere is undoubtedly injurious, dry rubbing should be substituted for frequent washing in our ships. Cleanliness and ventilation should also be rigidly enforced; and where men are placed in circumstances favourable to mental inaction and despondency, such employments and amusements as tend to counteract these states of mind.

RHEUMATISMUS—RHEUMATISM.

VARIETIES.—1. Acute. 2. Chronic. 3. Muscular.

1. RHEUMATISMUS ACUTUS—RHEUMATIC FEVER.

DEFINITION.—Acute inflammation of the larger joints, attended by well-marked febrile symptoms; often shifting from joint to joint; and, in many cases, attacking the fibrous textures of the heart.

SYMPTOMS.—The disease generally sets in soon after exposure to cold and wet, with all the symptoms of a severe attack of catarrh; the pain in the back and limbs being unusually severe, and accompanied by a sensation of coldness and stiffness. In the course of one, two, or three days, inflammation shows itself in one or more of the larger joints, characterised by redness and heat of surface, acute pain, extreme tenderness, tumour, and tension. There is great constitutional disturbance, with extreme restlessness, intense thirst, and loss of appetite. The pulse ranges from 90 to 120; and is full, hard, and jerking; the blood, drawn from a vein, is cupped and buffed; the tongue is coated with a thick and soft white fur; the bowels are usually obstinately costive; the urine scanty and high-coloured, and a strong acid reaction, but at this period of the disease generally free from sediment. The skin is often bathed in a profuse strong sour-smelling sweat, which, however, affords no relief. The febrile symptoms and the pain generally suffer an exacerbation at night.

The disease is rarely confined to the joints first affected; but after some hours or days, attacks fresh ones, sometimes continuing unabated in those first affected, at others leaving them quite free from pain and swelling. In rarer instances, it returns to the joints first attacked, and ultimately extends to all the large joints of the body. Some amendment usually takes place in about a fortnight; the pain lessens, especially at night; there is less fever and perspiration; the urine is more abundant, and lets fall a copious deposit of the mixed urates; the appetite returns; the thirst diminishes; the pulse falls; and the patient's movements become more free. Convalescence, however, is rarely uninterrupted, and the affection of the joints often assumes a chronic form.

In a large proportion of cases, the disease extends to the fibrous tissues of the heart, and the younger the patient the greater the liability to this affection. The symptoms which denote this formidable complication are dyspnœa, palpitation, and a sense of oppression, increased by pressure in the intercostal spaces, by inspiration, and by lying on the left side. In some cases pain in the region of the heart is superadded.

The pulse is generally quickened, and has a peculiar thrill. As this affection is often obscure, it should be carefully sought for, and its earliest indications attended to.

For the stethoscopic signs, see Pericarditis and Endocarditis.

Sometimes, too, the disease is complicated, and recovery retarded by attacks of bronchitis, pneumonia, or pleurisy; by inflammation of the brain and its membranes; and by inflammation of the sclerotic coat of the eye, all of which diseases are due to the rheumatic poison.

MORBID ANATOMY.—Inflammation of the *fibrous* and synovial membranes of the parts affected, with much effusion of clear or milky serum; and more rarely of deposits of lymph. In the heart, the results of Carditis and Pericarditis.

PATHOLOGY.—Rheumatism is essentially a blood disease; and the poison appears to be lactic acid. It also contains a very large excess of fibrine. The urine is excessively acid and high-coloured, and contains much uric acid.

CAUSES.—*Predisposing.* Previous attacks. Youth. Debility. Spring and autumn.—*Exciting.* Exposure to wet and cold.

DIAGNOSIS.—The pathognomonic symptoms of the acute form are inflammatory fever, with pains and inflammation of the larger joints, over which the integuments become distended, smooth, and of a peculiar pale-red colour. The severe muscular pains of commencing *typhus* may cause that disease to be mistaken for rheumatism. Rheumatism may coexist with *variola* (see page 310).

From Podagra (see Podagra). From *Neuralgia*, by the history of the case; by the presence of inflammation and fever; and by the fact that, in neuralgia affecting the same parts, the pain is generally confined to a single joint. From *syphilitic periostitis*, by the extreme tenderness on pressure of the inflamed portion of bone in that disease; and by its occurrence in the bones of the cranium, on the sternum, or on the shinbone, as well as in the bones forming the large joints; also, by the previous history of the case.

PROGNOSIS.—*Favourable symptoms.* A general, but not unnaturally profuse, perspiration; the repeated or continuous deposit of a lateritious or furfuraceous sediment in the urine.—*Unfavourable.* Metastasis of the inflammation to the heart, chest, or brain. The disease is very rarely fatal; but often leaves behind it organic disease of the heart by which life is shortened, or chronic inflammation of the joints, with a great susceptibility of future attack. In favourable cases, and in persons otherwise of good constitution, the duration of the disease is from three weeks to a month.

TREATMENT.—1. *General.* Since the system is saturated with acid, the most rational treatment is the alkaline, and it is the most successful. From half a drachm to two scruples of the bicarbonate of potash may be given, dissolved in half a pint of water, every three or four hours, or an ounce of lemon-juice taken with twenty grains of bicarbonate of potash dissolved in three ounces of water. The nitrate, bitartrate, and acetate may also be given with advantage. ℥i of nitrate of potash, taken at intervals in half a gallon of water, is in itself an efficient remedy.

A single full bleeding, followed up directly by sulphate of quinine in two-grain doses every three hours, is a mode of treatment which I have seen adopted, and have frequently practised, with very decided advantage. (G.)

The adoption of either of these methods of treatment does not preclude the use of other means in cases of unusual severity, or of a complicated character.

The bowels must be kept in free action by means of saline purgatives, such as a Seidlitz powder, or from 40 to 60 grains of compound jalap powder, given as often as necessary.

For the relief of pain, x or xii grains of compound ipecacuanha powder may be given at bed-time.

Warm baths may be used with advantage before the pain in the joints has become so severe as to create difficulty in moving the patient. When the disease is beginning to abate, they may also be administered two or three times a week. Carbonate of potash or of soda may then be added to the bath in sufficient quantity to render it decidedly alkaline.

2. *Local applications.*—The affected joints should be enveloped in cotton wool. When the skin perspires profusely, and the surface is very hot, cloths dipped in an alkaline lotion (Potassæ carb. ʒii Aquæ Oi.) and covered with oilskin, may be substituted; or, if the pain be very acute and the patient restless, lint saturated with belladonna or chloroform liniment, may be laid on the part. Small blisters applied to the joints as they are successively affected, often give great relief.

When the disease is complicated with heart-affection, cupping, followed by blisters to the region of the heart, is indicated; or, if the patient be very weak, a large blister, dressed with mercurial ointment, at the same time that calomel and opium are given to produce slight constitutional effects (Form. 329).

2. CHRONIC ARTICULAR RHEUMATISM.

SYMPTOMS.—The chronic form may be a consequence and termination of the acute, or it may be independent of it. In the first case, the joints are left weak, stiff, and in some instances œdematous; and the pain, which was before shifting, is now usually confined to particular joints. Sometimes, however, it still shifts from joint to joint, but is not attended by acute inflammation or fever. Exposure to wet and cold often brings on an attack, which continues for a considerable time, and at length goes off leaving the affected joints weak and stiff.

Chronic articular rheumatism, when not a sequel of the acute disease, generally attacks the smaller joints of the hands and feet, and is then commonly called rheumatic gout.

TREATMENT.—When the disease is confined to one or two joints, leeches on every marked return or increase of inflammation; blisters at a short distance from the affected joint, or even to the joint itself; and friction. When there is much effusion about the joints, or when the disease is more extensive, we must employ general remedies recommended for the acute disease. The vapour-bath is a most powerful remedy. The warm bath is of less efficacy, but the thermal mineral waters of Vichy, Aix-la-Chapelle. Karlsbad, Wiesbaden, Buxton, &c., have long enjoyed a high and deserved reputation in the treatment of chronic articular rheumatism. A warm climate also proves beneficial to cases which have arisen in a cold one, though warm climates are peculiarly favourable to the occurrence of rheumatic affections.

Remedies.—Dover's powder in repeated small doses (gr. v three times a day); Vinum colchici (♏xx.) in combination with opium (Tinct. opii, ♏v); guaiacum, in the form of the mixture, or ammoniated tincture; iodide of potassium (gr. iii to gr. v) with sarsaparilla (especially indicated where there is a syphilitic taint).

3. MUSCULAR AND TENDINOUS RHEUMATISM.

Varieties.—Some forms of the disease have distinct names, according to the seat of the affection; as *pleurodyne*, when it attacks the muscles of the side; *lumbago*, when the seat is in the loins; *crick in the neck*, when it affects the neck. Rheumatism of the muscles of the back of the thigh is sometimes, though incorrectly, called *sciatica*. The pain is very frequently localized in a particular tendon, at its insertion into the bone, *e. g.* the insertion of the deltoid, and tendo Achillis.

Symptoms.—Pain, varying in character and severity, from a dull aching to the most acute lancinating pain, affecting the entire body, the trunk, a single limb, or a single muscle or group of muscles; coming on sometimes suddenly, at others after shivering and slight feverishness: often forming the most distressing features of a common cold, and remaining after the other symptoms have vanished. The severe pains in the chest and abdomen, which accompany spinal irritation, are to be distinguished from rheumatic pains. (See Spinal Irritation.)

Prognosis.—*Favourable.* The disease is free from danger. Its duration may vary from a few hours or days to as many months or years. The general health is little if at all affected.

Diagnosis.—The pain is increased by motion of the affected parts, by percussion with the points of the fingers, and by the sudden removal of pressure; but it is relieved by firm pressure gradually applied. It is sometimes augmented, sometimes relieved, by the warmth of bed.

Treatment.—This form of rheumatism is also benefited by alkalies, but its complete removal requires a long continuance of the treatment. Guaiacum, in combination with alkalies, is often efficacious. Opiate liniments or small blisters may be occasionally applied to the painful part. Magneto-electricity, and the hot bath, often afford much relief. The condition of the urine will in every case furnish useful indication as to treatment. If it contain excess of uric acid we must persevere with alkalies.

PROPHYLAXIS.—Persons subject to rheumatism should wear flannel next the skin; they should protect the parts most liable to the disease; and avoid malt liquors and exposure to wet and cold.

PLEURODYNE.

Pain in the left side is present in almost all the functional diseases of young and middle-aged females; in dyspepsia, amenorrhœa, menorrhagia, leucorrhœa, hyperlactatio, and chlorosis, and in debility, however induced. In males it is equally common on both sides. It often accompanies chronic rheumatic pains of the joints or tendons. Acute pain in the muscles of the left side generally precedes by some days or weeks the appearance of shingles. (See Herpes zoster.)

CAUSES.—*Predisposing.* Debility.— *Exciting.* Over-exertion, as in coughing; flatulent distension of the stomach; the rheumatic poison.

DIAGNOSIS.—The *diagnosis* of pleurodyne is of great importance, though the disease itself is of little or none. It is distinguished from pleuritis, with which it is often confounded, to the great injury of the patient, by the absence of the constitutional symptoms of acute inflammation, and of the stethoscopic indications of pleurisy; by being increased by motion of the affected parts, as in raising the arm, or twisting suddenly round, or by a sudden inspiration or expiration; by the effect of sudden and slight percussion with the points of the fingers; and by the immediate increase of the pain on the removal of pressure. It is distinguished from the neuralgic pain preceding the eruption of shingles by its less severity.

COMPLICATIONS.—With chest disease (for it is a common consequence of a cough); with acute dyspepsia; and with any of the debilitating diseases mentioned above.

TREATMENT.—If chronic, the emplastrum belladonnæ, opii, or roborans should be applied to the seat of the pain; when acute, a mustard poultice. Symptomatic pleurodyne must be treated by removing its cause. When the affection accompanies rheumatism or gout, the treatment for those diseases should be adopted.

Allied to pleurodyne is an acute pain of the muscles of the abdomen or diaphragm, or of both together. That of the abdomen is apt to be confounded with peritonitis, as pleurodyne with pleurisy. The diagnosis is easy. Graduated pressure gives relief, except when a sudden expiration throws the muscles into action; but the sudden removal of pressure, percussion with the points of the fingers, and quick motion of the part affected, increase the pain. The absence of severe constitutional symptoms will assist the diagnosis, as will also the kind of respiration, which, in pleurodyne, is abdominal, in rheumatism of the muscles of the abdomen, thoracic. When the diaphragm is affected, the respirations are short and catching, and acutely painful.

Muscular rheumatism also attacks internal viscera, as the muscular texture of the heart, causing violent palpitation; the muscular coat of the œsophagus, giving rise to much pain in swallowing; and the muscular substance of the impregnated uterus leading to severe pains, similar to labour pains. Many internal muscular pains are connected with flatulence, or are symptomatic of dyspepsia.

LUMBAGO.

This disease occupies the mass of muscles in the loins, and, when severe, confines the patient to bed, or obliges him to walk carefully with crutches, or with the assistance of others. The slightest motion causes excruciating agony.

DIAGNOSIS.—From *disease of the kidneys*, by the urine remaining unchanged in character, or yielding merely the common deposits; and by the absence of symptoms of disease of the kidney. From *lumbar abscess*, by the absence of rigors, and of hectic fever, and by the negative results of a careful examination of the part affected. [It should be borne in mind that collections of matter in the muscles of the back may *point* at the lower part of the back itself, at any part of the abdominal parietes, or below Poupart's ligament.]

TREATMENT.—The general treatment is that of other forms of muscular rheumatism (see *supra*). The local treatment consists in cupping the loins, or in dry cupping, if the pain be very severe, followed by the emplastrum belladonnæ. In less severe cases, an opiate liniment (Form. 126, 128), Emplast. opii, or Emplast. picis, may be kept applied to the back.

PODAGRA—THE GOUT.

VARIETIES.—1. Regular gout; 2. Misplaced gout; 3. Atonic gout; 4. Retrocedent gout.

SYMPTOMS.—The first paroxysm of gout generally comes on about two o'clock in the morning, with pain in the ball of the great toe of one foot (more rarely in the heel, ankle, or instep), accompanied by rigor, followed by feverish heat. The pain increases till it becomes perfectly excruciating, and is accompanied by extreme restlessness. The joint is, at the same time, exquisitely tender, so that the patient cannot bear the weight of the bed-clothes, or the slightest jar or movement in the room. The pain having attained its acme towards the following evening, ceases sometimes suddenly, sometimes gradually, about midnight; a general moisture breaks out on the skin, the patient falls into a sound sleep, and in some cases wakes free from pain. But in the majority of cases, on awaking next morning, the parts, which were before so painful and swollen, are found of a deep red colour, tense and shining, the surrounding parts œdematous, and the vessels turgid. For several days and nights the same round of symptoms occur in a mitigated form, till at length the redness and the swelling subside, the skin desquamates, and the joint is either restored to its healthy state, or becomes the seat of the chronic form of the disease.

It rarely happens that one fit of gout is not followed, at a longer or shorter interval (sometimes of months, sometimes of years), by a second attack. Most patients indeed have several successive attacks, which at first occur at the same season of the year, but at length take place very frequently, extending first to both feet simultaneously or in succession, then to the hands, and at length to almost all the joints. These subsequent attacks set in at all hours of the day and night, commence sometimes in the hand, sometimes in the foot, sometimes in the great toe or thumb, in other instances in the joints of the wrist or ankle. They are attended with less pain, but with more constitutional disturbance. At length, after repeated attacks, the joints become stiff, and in many cases they are the seat of chalky deposits.

The fits of gout sometimes appear without warning, but they are generally preceded by dyspepsia, with its usual attendants, dejection of spirits, and irritability of temper; or by unusual coldness and numbness of the extremities, alternating with a sense of pricking or formication, frequent cramps, and unusual turgescence of the veins of the leg.

When the gouty diathesis prevails in the system, but without producing the usual inflammatory affection of the joints, it often appears as an affection of some internal part. If it attacks the *stomach*, there is great depression and anxiety, followed by intense gastralgia, nausea, vomiting, and eructations, frequently accompanied by pains and cramps of the trunk and arms. Sometimes there is obstinate constipation, sometimes diarrhœa. If the *heart* be attacked, palpitation, syncope, and angina are the symptoms present; if the *lungs*, dyspnœa, asthma, and sometimes a persistent spasmodic cough. When *the head* is affected, there are headache and giddiness, followed sometimes by apoplectic and paralytic affections. When it attacks the *spinal cord*, it gives rise to severe neuralgic affections, terminating in paralysis. These gouty affections of internal parts, without inflammation of the joints, have been termed *misplaced* gout, or *atonic* gout, on the supposition that the system had not strength to throw the disease out.

Sometimes the inflammation of the joints having come on in the usual manner, but without attaining the usual severity, or continuing for the customary time, suddenly ceases, while the disease is transferred to some internal part. This is called *retrocedent* gout.

PATHOLOGY.—A blood disease, caused directly by an excess of uric acid in the blood. The local symptoms are due to the deposit of crystalline urate of soda in the inflamed part, both on the surface of the synovial membrane, and within the substance of the cartilages and fibrous tissues themselves.

Uric acid may readily be detected in the blood of persons predisposed to, or suffering from, gout. Add six drops of ordinary acetic acid to a ʒj of the serum; suspend a thread of cotton in the mixture, and after twenty-four or forty-eight hours, a string of minute rhombs of uric acid will be formed along the thread. (Garrod.)

Chronic gout sometimes results in one of the most inveterate forms of albuminuria, and the kidneys are found reduced to half their size and weight, shrivelled and granular, the cortex atrophied, and the pyramids streaked with white lines of deposited urate of soda, constituting the "gouty kidney" of Dr. Todd.

CAUSES.—*Predisposing and remote.* The male sex; the adult age, and particularly the mid period of life (it seldom occurs before puberty, and in a large proportion of cases makes its first attack between 30 and 40); hereditary predisposition; plethora; a full diet of animal food; fermented and especially malt liquors; acid and acescent wines; a sedentary and studious life; dyspepsia. Gout is not peculiar to the rich, but often affects poor persons of temperate habits after long privation.

Exciting.—Cold to the feet; fatigue; anxiety; excessive evacuations; sprains and blows; intemperance; the ceasing of usual labour; sudden change from a full to a spare diet; the suppression of customary evacuations, as of the piles, which are common in gouty persons.

DIAGNOSIS.—From *acute rheumatism*, by the seat of the disease being the smaller joints, especially the great toe, while rheumatism attacks the larger joints. By the more intense colour of the inflamed part. By its more sudden attack. By the more frequent and distinct remissions of fever and pain. By the itching and desquamation. By the absence of the profuse acid perspiration of acute rheumatism. Sometimes by the age at which it occurs; acute rheumatism being common in childhood, while gout is very rare before puberty. By the more rapid and complete convalescence. Gout occurs in those who live freely, and in persons of full habit; rheumatism commonly in the debilitated. The metastasis from joint to joint, and the heart affections so common in acute rheumatism, are comparatively rare in gout.

PROGNOSIS.—*Favourable.* Youth, and an unimpaired constitution; a first attack; the more severe the paroxysm, the shorter its duration; the longer the intermission, the more effectual is the paroxysm in removing various anomalous diseases, to which the patient had been subject; its not being hereditary.—*Unfavourable.* Impaired constitution; advanced age; visceral affections; hereditary predisposition; the deposition of chalky matter in the joints: the disease suddenly leaving the extremities, and attacking the stomach, heart, brain, or lungs; anasarca, or albuminuria, or both combined.

TREATMENT.—*Indications.*—1. General. An attack of gout may be effectually shortened by a full dose of the *Vinum colchici* combined with opium (Form. 211) at bed-time; followed by a saline aperient in the morning; or, in the smaller dose (♏xx) three or four times a day. When given in smaller repeated doses the colchicum and opium may be combined with a saline aperient, according to the state of the bowels. When a sufficient depressant effect has been produced, the colchicum may be omitted, and the saline diaphoretics (Form. 229, 295) prescribed.

The exciting causes of the disease must be avoided by regular living, abstinence from fermented liquors, the moderate use of animal food. After the acute symptoms have subsided, we may direct friction with the flesh-brush; regular and brisk exercise; Bath waters; the regular use of mild aperients; the occasional use of alkaline medicines; and when dyspeptic symptoms are present, the treatment applicable to dyspepsia. Salts of lithia has been lately introduced as very suitable for the elimination of the gouty material. They promise to be useful. (See Form. 294.)

2. The *Local* treatment consists in wrapping the inflamed part in flannel, wool, or fleecy hosiery, and keeping the limb as still as possible. Opium and atropine lotions may be used to alleviate the pain.

Treatment of retrocedent Gout.—If the stomach be attacked, the liberal administration of stimulants, such as warm brandy and water, wine and aromatics; æther, ammonia, camphor, and musk. Sinapisms should be applied to the feet, with a view of restoring the external inflammation. Other forms of retrocedent gout require the treatment appropriate to idiopathic affections of the same organs.

GOUTY CONCRETIONS.—Gouty concretions, chalk-stones, or tophaceous deposits, consist chiefly of urate of soda, and are deposited around the joints, in the bursæ mucosæ, in the ligaments, aponeuroses, and cellular membrane, and even under the cuticle. The pain which they occasion may be relieved by warm poultices. Great relief is also sometimes experienced from applying rings of blistering plaster above or below the swollen joints. The joints may also be treated with iodine paint. A narcotic cataplasm or anodyne fomentation often affords great relief. Benzoic acid, combined with a salt of potash, in doses of a scruple about an hour after each meal; or benzoate of ammonia may be given and persevered in for a considerable period where extensive deposits have already taken place. The waters of Aix-la-Chapelle, Vichy, Töplitz, Marienbad—all of which contain lithia—should be taken in lieu of spirits, wine, or malt liquors. Sometimes suppuration occurs around the chalky joint. A foul ulcer results, and as the urate separates very slowly, the wound is healed with difficulty. It should be lightly dressed with a weak potash or lithia lotion.

SPECIAL DISEASES.

CHAPTER I.

DISEASES OF THE NERVOUS SYSTEM.

1. Of the Brain.
2. Of the Spinal Marrow.
3. Of the Nerves of Sensation.
4. Of the Nerves of Motion.
5. General Disorders of the Nervous System.
6. Mental Disorders.

DISEASES OF THE BRAIN.

CEPHALALGIA . .	Headache.
ENCEPHALITIS . .	Inflammation of the Brain.
MENINGITIS . . .	Inflammation of the Membranes.
HYDROCEPHALUS .	Water in the Head.
APOPLEXIA . . .	Apoplexy.
CHRONIC DISEASES OF THE BRAIN.	

CEPHALALGIA—HEADACHE.

Headache is a symptom of almost all acute and chronic diseases of the brain, as well as a distinct functional derangement of very frequent occurrence. It may be (*a*) External, or (*b*) Internal.

(*a*.) External.—1. Cephalalgia muscularis; 2. Cephalalgia periosteosa; 3. Cephalalgia neuralgica.

(*b*.) Internal.—1. Cephalalgia congestiva; 2. Cephalalgia dyspeptica, vel sympathetica. Cephalalgia organica.

EXTERNAL.—1. *Cephalalgia muscularis*, or pain of the muscular covering of the head, affects the occipito-frontalis and temporal muscles. *Diagnosis*.—The pain is diffused over the head, is increased by motion of the eyebrows and jaws, by pressure, and by percussion with the fingers. It is generally accompanied by muscular pain in the neck, shoulders, or other parts of the body. *Cause*.—Exposure to cold. *Treatment*.—That of catarrh when recent, and that of muscular rheumatism when chronic.

2. *Cephalalgia periosteosa.*—Seat, the pericranium. *Diagnosis.*—The pain is commonly limited to one spot, and is increased by firm and deep pressure, but is little, if at all, affected by action of the muscles. It sometimes affects the periosteum of the face at the same time, so that the nose is tender to the touch; and it frequently extends to other parts of the body, especially to the shin and sternum. When limited to one spot, it is commonly attended with swelling. *Causes.*—This form of headache is generally traceable to a syphilitic taint, and coexists with similar affections of other bones, syphilitic diseases of the skin, &c. The health also suffers. The appearance and expression of countenance are those familiarly known as *Cachexia syphilitica. Treatment.*—That of secondary syphilis. Iodide of potassium in five-grain doses is a valuable remedy in this form of headache. If the bone be affected, and matter formed, free incisions will be required, followed by the treatment prescribed in surgical works for the diseases of bone.

3. *Cephalalgia neuralgica vel periodica.*—Seat, the nerves of the internal angle of the orbit and side of the nose (*megrim*), fixed in one spot, causing a sensation as if a nail were driven into the head (*Clavus hystericus*), or of one side, more commonly the left, of the head and face (*hemicrania*). It occurs with regularity at the same intervals as ague, and in some instances at the longer intervals of ten days, a month, or a year. In some cases the intermittent passes to a continued pain, and in many patients the disease is never distinctly intermittent, but is characterised by irregular intervals of perfect ease, and by being bounded by the central line of the head and face. The paroxysm may last for any period from an hour to two days. The disease is more common in women than in men, and in young than in old persons. But it may occur at any age. In the worst case the pain is of the most acute character, and is brought on by eating or speaking, or by draughts of air. *Diagnosis.*—The absence of tenderness, and of increase of pain on contraction of the muscles of the scalp, distinguish it from the first and second forms.

Cause.—Exposure to cold and wet—marsh miasma. *Treatment.*—The same as for ague, viz., quinine in large doses, or liquor arsenicalis (Form. 133). The latter remedy, cautiously administered, is to be preferred. The general health must at the same time be attended to.

INTERNAL.—1. *Cephalalgia congestiva*, or *congestive headache*. This presents itself in three different states of constitution—the plethoric, the delicate and irritable, and the weak and leucophlegmatic. *Diagnosis.*—Obtuse pain, affecting the whole of the head, especially the forehead and occiput, combined in the *plethoric* with a bloated countenance, a full red eye, distension of the veins, a full pulse, and a dull and heavy expression of face: in the *delicate and irritable*, with flashes of light, floating specs before the eyes, noises in the ears, cold extremities, and a small, frequent, quick pulse; in *anæmic* subjects, with pale skin, lips, tongue, and gums, cold extremities, beating at the heart, violent throbbing of the carotid arteries, and small, frequent, quick pulse. In the two latter classes of persons, it is brought on in severe paroxysms, by sudden noises, mental emotions, or violent muscular exertion. *Treatment.*—In the *plethoric*, that of plethora (p. 256). In the *delicate and irritable*, by repose of mind, careful attention to the state of the stomach and bowels, and sedative medicines taken at bed-time occasionally (Form. 256, 274). In *anæmic* subjects the treatment of anæmia (p. 260).

A congestive headache allied to the first form (the plethoric) may be caused by narcotic and narcotic-acrid poisons; and may occur at the onset of febrile disorders (attended in these cases by pain in back and limbs), at the onset of attacks of apoplexy, and in the early stage of phthisis (when it commonly affects the forehead).

2. *Cephalalgia dyspeptica vel sympathetica.*—*Sick headache.*—*Diagnosis.*—From other headaches by the marked disorder of the stomach, or of the whole alimentary canal. *Symptoms.*—Pain usually fixed, in the left temple, over the right eye, or on the forehead, commonly commencing when the patient first rises in the morning, and in slight cases continues till after breakfast; in more severe ones, it begins as a diffuse heavy pain, and gradually becomes fixed in one spot, accompanied with nausea, flatulence, sour eructations, and vomiting. There is also confusion of thought, dimness and indistinctness of vision, and singing in the ears. Sometimes the fit is removed by free discharge of food, or of frothy mucus or bile from the stomach; and this is sometimes accompanied, or followed by, diarrhœa. Its duration varies from some hours to three or four days, and in confirmed cases it returns at short intervals, and is attended with great suffering. Sometimes there is much flatulence, and relief is only afforded by free eructation. *Cause.*—Derangement of the functions of the stomach and bowels. The abuse of aperient medicines, by which the tone of the alimentary canal is weakened. Sick headaches are common just before and after the menstrual period. *Treatment.*—Gentle aperients in combination with alkalies, as rhubarb with soda, or magnesia. Regulation of the diet; proper exercise; emetics, where the cause is transient. In cases of obstinate sick headache, emetics of ipecacuanha may be administered every morning with the best effect. If large quantities of bile are ejected from the stomach (bilious headache), cholagogue purgatives (Form. 275) will be found useful. When the bowels are very irritable and act irregularly, an occasional dose of Gregory's powder, or rhubarb and bismuth. When much flatulence is present, turpentine or kreasote may be given. Cold to the head sometimes acts as a palliative. A draught containing from five to ten grains of carbonate of ammonia given at the commencement of the attack will sometimes arrest it.

3. *Cephalalgia organica.*—*Diagnosis.* This pain is distinguished from the foregoing forms either by appearing to affect the entire brain, or by being fixed and deep-seated. It may be accompanied by disordered digestion, but it is not relieved by vomiting. It is also subject to marked increase and decrease of severity, but rarely suffers a com-

plete intermission. The nature of the disease is at length made known by some marked disorder of the functions of the nervous centres, by paralysis, spasms, or convulsions. The pain is allied to the plethoric variety of congestive headache. *Treatment.*—That of the disease of which it is the symptom. The state of the circulation through the brain must be carefully watched, and local and general blood-letting, purgatives, and counter-irritants, must be resorted to; at the same time that strict attention is made to the state of the general health. In chronic inflammatory affections of the brain, a course of mercury, carried to the extent of affecting the mouth, will sometimes effect a cure.

Great caution is necessary in inquiring into the cause of headache, and in discriminating one form from another; the treatment will entirely depend on the accuracy of the diagnosis. Sometimes, for instance, a patient complaining only of headache will be found to be suffering from phthisis pulmonalis. (G.)

ENCEPHALITIS—INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

Synonyms.—Phrenitis. Meningo-encephalitis.

Species.—1. *General,* that is, involving the whole, or a considerable part, of the substance and membranes of the brain.—2. *Partial,* or affecting only a part of the substance, or of the substance and membranes, of the brain.

1. GENERAL INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

Symptoms.—This disease does not always commence in the same way. In one class of cases it begins with acute pain in the head and violent delirium; in a second with nausea, bilious vomiting, and obstinate constipation; in a third with a paroxysm of general convulsions; in a fourth, and very rare class, with loss of speech.

The disease, when fully formed, is characterised by excruciating pain in the head; throbbing of the temporal and carotid arteries; flushed face; injected and brilliant eyes; contracted pupil; and a peculiarly wild expression of countenance. There is intolerance of light and sound, extraordinary acuteness of the senses, constant watchfulness, want of sleep, fierce delirium, and convulsions. The skin is hot and dry, the pulse hard and frequent, sometimes full, sometimes contracted; the tongue red and dry, or covered with a white fur; there is intense thirst, with nausea and bilious vomiting; and the bowels are obstinately confined. These symptoms belong to the stage of *excitement*, and continue for a variable period of from one to three days, when, gradually subsiding, they are succeeded by low muttering delirium, deafness, indistinctness of vision, insensible pupil, strabismus.

twitchings of the muscles, tremors, relaxation of sphincters, occasional retention of urine, cold sweats: or by profound coma.

In *Insolation* or *sunstroke* the disease is very rapid, and death may occur in from one to forty-eight hours from the seizure. The pupils are contracted and fixed, the breathing hurried. The symptoms of encephalitis soon pass into coma. Occasionally there are convulsions from the commencement of the attack; but in the majority of cases the patient dies without making the slightest movement.

TERMINATIONS.—When fatal, in coma; or in great prostration of strength, with typhous symptoms. Recovery may be complete, or the disease may end in mania, dementia, or paralysis. Its duration varies from one or two days to two or three weeks, or even more.

CAUSES.—Excessive heat, or great vicissitudes of temperature; the direct rays of the sun (*coup de soleil*); violent exercise; excited passions; intense study; irritating matter in the stomach; external violence; the abuse of spirituous liquids; metastasis of gout, rheumatism, erysipelas, exanthematous fevers, dentition. Inflammation of the brain may also supervene on pneumonia, renal affections, and all febrile diseases, especially pyæmia.

DIAGNOSIS.—From *mania*, by the marked febrile symptoms and rapid course. From *febrile delirium*, by the delirium being a primary and not a secondary affection. From *the effects of loss of blood*, by the history of the case, the inflammatory symptoms, and the flushed face. From *delirium tremens*, also, by the history of the case, by the hot dry skin, and high fever, by the want of consciousness, and by the absence of the tremulous motions of the body and limbs. In most cases of delirium tremens the face is pale and the skin moist; the limbs tremble, and the patient can understand and answer questions.

MORBID ANATOMY.—Thickening of the arachnoid, effusion of serum, of lymph, of a mixture of the two, or of pus, under the arachnoid and into the meshes of the pia mater, or into the ventricles, with softening of their walls; the incised surfaces of the brain present numerous bloody points, the medullary surface is of a light pink hue, and the cineritious substance of an ashy red, not removed by washing; suppuration, softening, or hardening of the substance of the brain. In death from sunstroke, great engorgement of the lungs and right cavities of the heart will be usually found.

PROGNOSIS.—*Favourable.* The return of sleep and consciousness; a warm and equable perspiration; diarrhœa; hæmorrhage from the nose; diminished frequency, and greater fulness and softness of the pulse. If preparations of mercury have been given, the occurrence of salivation.—*Unfavourable.* Stupor, difficult deglutition, profound insensibility, tremors, convulsions; involuntary evacuations; suppression of urine; pallor of the face. The mortality in sunstroke is often more than 50 per cent.

TREATMENT.—I. *During the period of excitement. Indication.* To lessen the force of the cerebral circulation.

(*a.*) By applying to the shaved head cold lotions constantly renewed, ice, or a stream of cold water. The latter is greatly to be preferred, especially when there is violent delirium.

(*b.*) By bleeding.—A copious and sudden evacuation of blood from a free orifice in the arm, in the erect or semi-erect position, to be repeated, if necessary, proportioning the quantity to the age, sex, temperament, and habit of the patient; followed, if necessary, by cupping or leeches to the temples, or by opening the temporal artery.

(*c.*) By active purging at the outset with castor or croton-oil, or with a full dose of calomel and colocynth, and salivation, if possible, induced by half-grain doses of calomel every two, three, or four hours.

(*d.*) By depressants, in doses short of inducing vomiting. Of these tartar-emetic is the best, in doses of a sixth to a fourth of a grain, given every hour until an effect has been produced upon the pulse.

(*e.*) By counter-irritants to the extremities, such as the mustard-poultice, or a large blister to the inside of the thighs, or hot water to the feet frequently renewed.

(*f.*) By strict antiphlogistic regimen. The food should consist of barley-water, milk, gruel, arrowroot, and the like.

(*g.*) By complete rest and perfect quiet. The sick-room should be kept dark and silent. The head and shoulders should be raised and kept cool.

II. *During the period of torpor.*—Brisk purgatives may be given with advantage, and the scalp freely blistered.

In extreme collapse, ammonia, wine, and brandy must be given, with beef-tea and nourishing food, and opium or laudanum may be cautiously administered. If deglutition be imperfect, food and medicine must be given by the rectum. The state of the bladder must be frequently ascertained, and, if there be retention, the water must be drawn off two or three times a day.

III. *During convalescence.*—The patient must be narrowly watched, the diet carefully regulated, and the bowels kept free by gentle aperients. He should not be allowed to resume his ordinary occupation till his health is quite re-established. In case of relapse, cold applications to the head, counter-irritants, and more active purgatives should be resumed. If the mind does not recover its tone, the memory be impaired, and the patient remains weak and irritable, the cold douche or the shower-bath every morning, with or without blisters to the scalp, or a seton in the neck or arm, may be resorted to.

In the treatment of sunstroke the cold douche is very serviceable.

2. PARTIAL INFLAMMATION OF THE BRAIN WITH OR WITHOUT IMPLICATION OF ITS MEMBRANES.

SYMPTOMS.—These are often very obscure; and vary with the extent, degree, and progress of the inflammation, as well as with the part of the brain attacked. In most cases, the first symptom is pain in the head, more or less severe, rarely altogether absent, but subject to increase from causes affecting the circulation, and accompanied from the first, or followed after a time, by giddiness, singing in the ears, indistinct or disordered vision, numbness or increased sensibility of the fingers, of the hands and arms, or of other parts of the surface of the body; and slight convulsive movements of the limbs, with occasional attacks of nausea and faintness. The patient is restless and irritable, or suffers from depressed spirits; the sleep disturbed, and the mind generally more or less impaired. The circulation is very variable, the pulse being at one time slow and regular, and the countenance pale; at another, the pulse frequent and the face flushed; these opposite states often alternating with each other at short intervals. The patient suffers from nausea and anorexia, and is liable to frequent attacks of vomiting. As the disease advances these symptoms become more strongly marked, and rigid contraction of particular muscles or groups of muscles are superadded, occasioning squinting, distortion of the features, difficult and indistinct pronunciation of particular letters or words, and sometimes great difficulty in swallowing. When the muscles of the extremities are thus affected the limbs assume a flexed position, and any attempt to move them occasions great pain. The pupils generally become less active, dilated, or unequal, and the sight of one or both eyes is impaired. In a still more advanced stage the partial contractions of the limbs are exchanged for very extensive and constantly-increasing loss of power and sensation, all the senses fail, the sphincters are relaxed, and the patient sinks utterly helpless and exhausted.

The duration of this disease is extremely variable. It may assume from the first an acute character, and terminate fatally in a few days; or it may run a chronic course of several weeks, months, or years; or the chronic form may, at any time, be exchanged for an acute attack, with extensive inflammation of the membranes of the brain.

In some cases general convulsions, usually stronger on one side of the body, may supervene.

MORBID ANATOMY.—Congestion of the affected portion of the cerebral substance; hardening of its texture; white or red softening: small extravasations of blood; infiltration of pus, contiguous to inflamed or necrosed bone; encysted abscess; fatty degeneration, ossification, or aneurism of the vessels; gangrene; a cystic entozoon surrounded by inflamed brain tissue; scrofulous tumours. The membranes will be found implicated according to their proximity to the seat of irritation or inflammation. The effusion of serum is common to several of these conditions. In certain cases we may trace the local disease to the impaction of one of the cerebral vessels by a clot of fibrine derived from an aneurism or diseased cardiac valve.

CAUSES.—Some of those of encephalitis, such as the eruptive fevers and pyæmia. Scrofulous or syphilitic diseases of the bones of the head, blows on the head, entozoa.

DIAGNOSIS.—From general encephalitis, by the partial character of the rigidity, spasm, or paralysis. Only one side of the body, or a particular limb or organ, may be thus affected. There may be merely inequality of the pupils, or squinting of one eye and double vision, or slight deviation of the tongue or uvula from the median line, or numbness and twitching of a single limb may be the only indication.

In forming our diagnosis of the exact seat of the disease, we must bear in mind the following facts:—

1. Disease of the right side of the brain causes paralysis, or some disorder of the left side of the body, and *vice versâ.* But to this the face is often an exception. According to Burdach, "in 28 cases of cerebral lesion of one side, the muscles of the opposite side of the face were paralysed; in 10 cases those of the same side. Paralysis of the muscles of the eyeball occurred in 8 cases on the same side, in 4 on the opposite." The tongue is almost always paralysed on the side opposite to that of the face, and its extremity is pulled towards the paralysed side.

2. So long as the disease is confined to the white substance of the *cerebral lobes*, and does not cause pressure on the surrounding parts, its presence is not manifested by disordered nervous function.

3. Disease affecting the *right corpus striatum* produces paralysis of motion on the left side of the body (left hemiplegia), and *vice versâ.*

4. Disease of the *right optic thalamus* results in paralysis of sensation on the left side of the body, with more or less disorder of vision, and *vice versâ.*

5. Disease of the *right crus cerebri*, or *right half of the Pons varolii*, produces paralysis of motion and sensation on the left side of the body, and *vice versâ.*

6. A clot or tumour in the *centre of the Pons varolii* results in more or less complete paralysis of motion and sensation on both sides of the body, with disordered action of the muscles of the eyes and eyelids, and interference with the auditory function.

7. Disease affecting the *right lobe of the cerebellum* causes disordered motion on the left side of the body, and *vice versâ*, with sensations of rolling in a particular direction, of going downwards or upwards, &c.

8. A clot within, or pressure upon, *the medulla* is manifested by derangement of the functions of deglutition and respiration.

Paralysis due to disease of the spinal cord is distinguished at a subsequent page.

To return from these general considerations to a diagnosis of the particular nature of the cerebral disease:

I. If symptoms of encephalic inflammation set in after chronic discharge of offensive matter from the ear, we may be pretty sure that *caries of the petrous portion of the temporal bone* has induced purulent inflammation of the contiguous part of the brain or its membranes.

II. When a delicate scrofulous child becomes sleepy, heavy, and listless, and gradually lapses into a state of unconsciousness, with partial convulsive twitchings or clenching of the hand, grinding of the teeth, squinting and uprolling of the eyes, we may generally conclude that a *scrofulous tumour* exists in the substance of the brain, or attached to its membranes.

III. Vertigo, with sudden circumscribed pain in the head, followed by severe and repeated epileptiform convulsions, have been caused by the cystic entozoa.

IV. *Chronic abscess of the brain* progresses most insiduously, *e.g.* A lad received a lacerated wound over the left frontal eminence. He was stunned for a few minutes, but soon recovered. Eight days after the accident he resumed work, and continued it uninterruptedly until three days before his death. The wound cicatrised by the thirty-second day. There were no head symptoms, not even a trace of pain; the health and spirits were good, but he showed a little irritability of temper. On the thirty-ninth day he appeared pale and listless, and complained of pain in the epigastrium and sickness; he had passed urine during sleep the preceding night, and he faltered once in walking to the infirmary, as if he had lost for a moment the use of his limbs. He again wetted the bed at night, and the next day lost the use of his right side. The following morning the power of deglutition was gone, and by 4 P.M. he had gradually lapsed into complete coma, with stertorous breathing, and a slow, laboured, irregular pulse. He continued in this state until 3.30 P.M. next day, and then died. A thick-walled abscess, containing six ounces of thick greenish matter, occupied the anterior lobe of the left cerebral hemisphere, distending the membranes.

Since abscess of the brain from external violence may thus insiduously progress under the eye of the medical practitioner, we can scarcely hope to receive timely intimation of the presence of the disease when it arises from some internal cause, unless, indeed, it involve one of the centres of sensation or motion, or the root of a particular nerve.

Apoplexy and partial softening of the brain may arise in people beyond middle age from disease of the blood-vessels.

PROGNOSIS.—Unfavourable in every stage of the disease, but especially when rigid contractions or paralysis have set in.

TREATMENT.—Will be indicated by the cause; that of encephalitis generally, but less active. If there be great heat of the head, cupping or leeches will be required. In milder cases, blisters behind the ears or to the nape will suffice. In chronic cases a seton may be established at the back of the neck. The daily use of gentle saline aperients to keep the bowels in free action, a spare diet, and rest of mind and body. When the meninges are involved the constitutional effects of mercury may be induced with advantage.

MENINGITIS—INFLAMMATION OF THE MEMBRANES OF THE BRAIN.

SYNONYM.—Arachnitis.

SYMPTOMS.—*Inflammation of the arachnoid and pia mater* commences differently in different cases. Sometimes it begins with sudden and violent pain in the head, with loud screaming, followed by convulsions. In other instances it commences suddenly with a long-continued paroxysm of general convulsions. In a third class of cases the attack is less sudden, the convulsions being preceded for two or three days by a general feeling of discomfort, slight headache, nausea, and vomiting. The pulse is generally quickened, but is sometimes less frequent than in health. When the disease is fully formed, the leading symptoms are acute pain, often expressed by sharp, piercing cries, and increased by motion; intolerance of light and sound; grinding of the teeth, sleeplessness; furious delirium; a flushed face and suffused eyes. Twitchings and convulsions are commonly present, and sometimes strabismus; vomiting is common; the bowels are usually confined; and the disease, when fatal, generally terminates in coma.

Inflammation of the dura mater sets in with pain in the head, fever, and rigors, which often recur at regular intervals, and simulate ague. The intellectual faculties are at first but little affected, but during the progress of the disease the patient often falls into a state of coma. If the inflammation extend to the other membranes, or to the substance of the brain, the symptoms proper to inflammation of those parts show themselves. This disease is rarely idiopathic, but follows on injuries to the scalp or skull, or on inflammation of the ear.

CAUSES.—Meningitis is often the chief symptom in the progress of the infectious fevers. It is commonly the first result of exposure to the direct rays of a burning sun. In childhood the most common cause is the deposit of tubercle upon the surface of the membranes constituting the variety known as "Tubercular Meningitis." (See p. 372.)

TREATMENT.—Distinguish the cause and treat accordingly. Against sunstroke (*Insolatio, coup de soleil*) the cold douche must be applied to the head; stimulants freely exhibited. The room should be darkened, and the head and spinal region blistered.

The meningitis of fever requires the treatment described under *Typhus*.

In *tubercular meningitis* we must be chary in the abstraction of blood; and, if safe to do so, avoid it altogether; otherwise the treatment will be that recommended under Acute Hydrocephalus.

HYDROCEPHALUS—WATER IN THE HEAD.

VARIETIES.—1. Acute; 2. Chronic.

1. ACUTE HYDROCEPHALUS.

SYMPTOMS.—This disease, like inflammation of the brain and its membranes in the adult, varies in its onset. Sometimes it is preceded, for a considerable period, by languor, inactivity, loss of appetite, nausea, vomiting, parched tongue, hot dry skin, flushing of the face, and other symptoms of pyrexia, or by the symptoms of infantile fever. (See p. 332.) In a second class of cases, it begins suddenly with the symptoms of inflammation of the brain and its membranes. (See p. 370.) In a third class of cases, it comes on obscurely, in the course of febrile disorders or of the exanthemata.

The disease itself is characterised by acute darting pains in the head, with heat of scalp; great sensibility to light, suffused redness of the eyes, flushed countenance, and hot and dry skin. The pupils are contracted, and the brows knit. The patient is very restless, moans incessantly, tosses about, and rolls the head from side to side. The sleep is short and disturbed by a start or scream. The gait is tottering, and the hand is often raised to the head. The pulse is accelerated, hard, and quick: the respiration hurried and sighing. The tongue coated; there is nausea or vomiting; the bowels are either obstinately confined, or unusually loose, with fœtid evacuations; and the urine is scanty. Delirium and convulsions are sometimes combined with these symptoms of the stage of *excitement*. In infants there is at first strong pulsation of the fontanelles. Afterwards they become tense and bulged outwards.

After a longer or shorter period, the symptoms become less violent, the pain is less acute, the patient keeps up a low moaning; an uneasy sleepiness succeeds a constant state of watching; the pupils are dilated, and strabismus is often present; the muscles of the fore-arm are rigid and occasionally convulsed; the fingers are clenched upon the thumb; the pulse is now preternaturally slow and often intermitting, but subject to great and sudden acceleration on change of posture; and the respiration is more frequently interrupted by deep sighs. The strabismus increases; the pupils become more dilated and cease to contract on being exposed to light; and double vision or complete loss of sight, with lethargic torpor, succeed.

In unfavourable cases the pulse resumes its quickness, and becomes extremely small and rapid: the respiration is difficult or stertorous; the limbs are convulsed or paralysed; the skin is covered with a cold sweat; the evacuations become involuntary; and at length the patient expires in convulsions, comatose, or exhausted.

Acute hydrocephalus in the adult.—This is a rare occurrence, hydrocephalus being peculiarly a disease of infancy and childhood. But Heberden relates the following case:—"An adult was seized with intolerable pain of the head, sometimes had a voracious appetite, and sometimes none; became delirious, convulsed, stupid, and died: the ventricles of the brain were found so distended with water, that as soon as a puncture was made the water flew out to a considerable distance." (This is probably a case of hydatid tumour.)

TERMINATIONS.—In slow recovery; in death; or in chronic hydrocephalus.

MORBID ANATOMY.—Sometimes enlargement of the head, separation of the sutures, and protrusion of the membranes. Serum, limpid or turbid, in the ventricles of the brain or beneath the membranes; softening of the surrounding cerebral substance; flattening of the convolutions; masses of tubercular matter imbedded in the substance of the brain. The pia mater unusually vascular; the arachnoid opaque; minute semi-transparent or opaque bodies, single or in patches, in the substance of the pia mater, or larger portions of tuberculous matter from the size of a millet-seed to that of a pea deposited upon the surface of any of the membranes (*tubercular meningitis*).

CAUSES.—*Predisposing.* Infancy and childhood; debility; scrofulous diathesis.—*Exciting.* Intestinal irritation; dentition; extension of inflammation from the ear; febrile and exanthematous disorders; premature application to study.—*Proximate.* In the greater number of instances tubercular deposits in the pia mater, giving rise to inflammation of the membranes.

DIAGNOSIS.—Heat of the head, distension of the fontanelle. Spasm and twitching of the muscles, or actual convulsions, are the distinguishing marks; followed by strabismus, dilated pupil, and profound stupor. The tubercular nature of the disease may be suggested by hereditary tendencies, by the actual presence of tubercles in the lungs, or other manifestations of the scrofulous diathesis, such as enlarged cervical glands. It is necessary to distinguish this disease from one of an opposite character, called *spurious hydrocephalus,* which has the following characters: *a pale cheek, a cool or cold skin,* an expression of great languor, and *an absence of febrile symptoms,* or, at the most, an occasional and transient flushing of the face; to which may be added, in the case of infants, a sunken instead of swollen fontanelle. On inquiry, the child will be found to have suffered from loss of blood, from long-continued diarrhœa, or from some other exhausting discharge.

PROGNOSIS.—Very unfavourable; especially if there be squinting, weak intermitting pulse, great enlargement of the head, apoplectic stertor, difficult respiration, and involuntary evacuations.

TREATMENT.—The *general treatment* will be that appropriate to Inflammation of the Brain (see p. 366), due regard being paid to the strength and constitution of the patient, and to the existence of any particular source of irritation. If the disease be general and acutely inflammatory, small doses of grey powder may be given every three hours. If the gums be hot and swollen they should be freely lanced, and a leech may be applied to the mouth or behind the ear. In the threatening convulsions and insomnia of dentition, conium is a valuable remedy.* When the disease is protracted and the scrofulous diathesis well marked, we must abstain from the continued use of mercurials and trust to local treatment, to aperients and to sedatives.

The *local* inflammation should be treated by the application of cloths wetted with cold water, vinegar and water, iced water, or the spirit lotion to the head. Cold water may be dropped on the slightly raised head, while the body and extremities are immersed in warm water.

2. Counter-irritants, such as mustard poultices or blisters to the temples, back of the ears, or neck, may be simultaneously used.

2. CHRONIC HYDROCEPHALUS.

SYMPTOMS.—Children are sometimes born with this disease. It rarely occurs in the adult; but Dean Swift died of it, and other cases are on record. It takes place at all periods between birth and the eighth year, seldom after. When it occurs after birth it comes on slowly and insidiously; or it follows the acute form. Its presence is indicated by drowsiness, languor, strabismus, vomiting, costiveness, coma, and convulsions; the bones of the head separate, the fontanelles enlarge, and the head acquires an enormous size. The patient may survive, in spite of immense enlargement, for months or even years.

CAUSES. — *Predisposing.* The scrofulous diathesis. — *Exciting.* Injury to the brain during labour; tumours within the cranium; the causes of other dropsies; dentition; irritation in the intestinal canal. It is also a consequence of the acute form.

DIAGNOSIS.—The history of the case, the large size of the head, and the prominence of the fontanelles.

Parents often express anxiety about the large size of their children's heads, supposing that the enlargement is due to water in the head. As this question is often put to the medical man, it is well that he should be cautioned not to attribute a large head to this cause, unless there are other decided symptoms of the disease.

PROGNOSIS.—The disease generally ends in death, with convulsions. If the bones yield and separate, its fatal termination is protracted.

TREATMENT.—*Indications.* I. To promote the absorption of the effused fluid. II. To improve the health.

(*a.*) Blisters to the head, kept open for days or weeks by cantharides or savine ointment; frictions with tartar-emetic ointment; or an issue over the fontanelles. The anterior fontanelle has been punctured at the side of the longitudinal sinus, and much serum withdrawn in several cases, but the results have not been such as to justify the operation. Pressure by means of adhesive plaster, and the constant application of cold, may retard or altogether prevent the further effusion of fluid, until the sutures are well knit.

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* See the Editor's work on the use of Conium, &c.

(*b*.) Mercury; applied externally, and given internally, until constitution symptoms are evident. In constitutions tainted by syphilis and scrofula, the perchloride and iodide of mercury are appropriate.

A light nutritious diet and a little wine may be given at short intervals throughout the day. Warmth and a change of air, especially if the patient live in a low and damp situation, to the sea-side, or a dry and bracing inland spot.

Tonics—sulphate or iodide of iron, or Vinum ferri according to the age; and the mineral acids.

APOPLEXIA—APOPLEXY.

DEFINITION.—Sudden loss of motion, with more or less derangement of perception, and sensation caused by injurious pressure upon the brain with or without rupture of some of its fibres.

Varieties.—1. Simple or congestive; *i. e.*, congestion of the vessels of the brain without rupture; 2. Serous, or congestion with serous effusion; and, 3. Hæmorrhagic, or congestion with rupture.

SYMPTOMS.—This disease makes its attack in one of three ways:—1. Suddenly, the patient falling down without warning, as if from a blow. 2. After a short premonitory stage, consisting of acute headache, sickness, and faintness. 3. With sudden hemiplegia.

In the first form of the disease, and when there is much blood effused, the patient falls to the ground, foaming at the mouth, his neck swollen, his face livid, his pupils dilated, and the mouth slightly drawn to one side. The urine and fæces are discharged involuntarily, the extremities are cold and livid, the skin bathed in a cold sweat, and death may take place in a few minutes.

When the quantity of blood is moderate, the fit is characterised by more or less stupor, and a slow and noisy, or stertorous and puffing breathing; difficult deglutition; flushed and livid countenance; prominent and motionless eye, and, generally, unequal pupils. The limbs are either motionless, rigid, or convulsed; these effects are usually more marked on one or other side. The bowels are either obstinately confined, or the evacuations are passed involuntarily; the urine also is either passed involuntarily, or, being retained till the bladder is full, dribbles away. The pulse is full, strong, and quick; but often less frequent than natural.

In slighter cases the patient does not lose consciousness, and the speech is only slightly and transiently affected. In other cases the chief indication of the paralytic seizure is loss or derangement of this faculty.

Apoplexy is sometimes preceded for a considerable period by premonitory symptoms, such as giddiness, headache, a sense of pressure in the head, confusion of ideas, incoherence, loss of memory, faltering speech, flushing of the face, hæmorrhage from the nose, flashes of light, noises in the ear, illusions, double vision, transient blindness or deafness, drowsiness, numbness of the extremities, pallor, nausea, vomiting, and faintness.

TERMINATIONS.—Suddenly in death. In death, after a variable interval. In complete recovery, which is commonly preceded by vomiting and profuse perspiration. In partial recovery, with more or less impairment of mind, and more or less extensive paralysis.

MORBID ANATOMY.—In *congestive* or *simple* apoplexy (distension of the vessels of the brain, with or without effusion into the ventricles, or at the base). In *serous* apoplexy (effusion of serum into the ventricles, or between the membranes). In *hæmorrhagic apoplexy* (effusion of blood into the substance of the brain, into the ventricles, at the base, or on the surface).

The softest and most vascular parts of the brain are those in which hæmorrhage is most liable to occur. In 444 cases tabulated by Dr. Aitken, the hæmorrhage happened 268 times in the corpora striata; 39 in the thalami optici; 81 in the lobes of the cerebrum; 22 in the pons Varolii; and 34 in the other parts of the encephalon, being at the respective rates of 60, 8, 20, 5, and 7 in the hundred. We often meet with evidence of a seizure previous to the fatal attack, such as a recent clot with circumscribed inflammatory softening of the nerve substance around it; or an old contracted colourless clot containing blood crystals; or a small cicatrised cavity containing a little serum.

DIAGNOSIS.—From the effect of spirituous liquors, by the odour of the breath. From the ordinary effect of narcotic poisons, by the history of the case. From both by some difference in the motor power of the two sides of the body; *e. g.*, one pupil may be contracted, and respond to the stimulus of light, when the other is dilated and immoveable; the muscles of the extremities on one side will generally be found perfectly flaccid, and the arm or leg falls from the hand like a mass of inanimate matter, while the muscles of the extremities on the other side will be found to be more or less rigid. If the limbs be convulsed, the movements on the two sides will, on careful examination, be found to be unequal. Sooner or later some such positive evidence of localised injury to the brain will be manifest. In order to make a correct diagnosis of the exact seat of injury, and form a just prognosis, attention must be paid to the facts enumerated in the diagnosis of partial encephalitis. (See p. 368.)

PROGNOSIS.—*Favourable.* Youth; slight impairment of the intellect and senses; hæmorrhage from the nose or hæmorrhoidal vessels; diarrhœa; profuse perspiration; a pulse of natural frequency and character; natural breathing.—*Unfavourable* in proportion to loss of consciousness; a full, hard, jerking pulse; loud stertorous breathing, with a puffing out of the cheeks; repeated shiverings, followed by high fever; repeated vomitings; spasm, rigidity, or convulsions; involuntary evacuations; retention of urine; cold extremities; cold and clammy sweats.

CAUSES.—*Predisposing.* A certain age: from the fiftieth to the eightieth year: the liability increases as age advances. Few cases occur under twenty, and very few indeed in infancy and childhood. A certain make of body, combining a short thick neck, large chest, florid complexion, and stout person; but the disease often occurs in persons of the opposite conformation. Hereditary tendency; a sedentary life with overfeeding; suppression of usual evacuations; plethora, however induced; diseases of the valves of the heart preventing the free return of blood from the head. The chief *proximate* cause is disease of the blood-vessels of the brain, the several stages of which appear to be fatty degeneration, atheroma, and ossification of their walls. (See Atheroma.) When the coats of the blood-vessels are thus diseased, they lose their elasticity and contractility, and become dilated and attenuated, and in this condition the least excitement of the circulation causes increased fulness and a tendency to rupture.

Exciting.—Violent exercise; strong expiratory efforts, as in singing and playing on wind instruments; straining at stool; fits of coughing; sudden and violent emotions; exposure to intense cold or heat; long stooping, or suddenly rising from the stooping posture; pressure on the neck; venereal excitement; intemperance; narcotic poisons, such as opium; suffocation by drowning, hanging, or strangulation, or by the narcotic gases, especially carbonic acid and carbonic oxide.

TREATMENT.—During or immediately after the fit, first loosen the patient's neckerchief and shirt-collar, raise his head, or place him, if convenient, in a chair, and open the window of the apartment. When the face is turgid and the eye injected, or, the face being pale, the pulse is full, hard, and jerking, we may open a vein in the neck or arm, or partially divide the temporal artery, and allow the blood to flow till the approach of syncope, taking care that the patient does not faint. But when the face is pale, and the pulse feeble and intermittent, the patient must be treated as if he were in a fainting fit, and the bleeding must be postponed till decided reaction has occurred, and the symptoms just stated have shown themselves.

In the after-treatment, the *indication* is to reduce the action of the heart, and diminish the force of the circulation through the brain.

1. By bleeding from the arm at intervals, from a small orifice, in the semi-erect position, and with constant reference to the effect produced upon the pulse and aspect of the patient, whenever and so long as there are evidences of fulness of blood, or excitement of the circulation.
2. The application of leeches and cupping-glasses to the head and neck.
3. Drastic purgatives, of which croton oil, in doses of one or two drops, is the most easily used and most efficacious. Purgative enemata.
4. Cold to the head, if there be increased heat.
5. Blisters to the nape, and, after a time, to the scalp.
6. A diet, consisting at first of farinaceous food, passing to a more generous diet cautiously and gradually.

7. If the disease take place soon after a full meal, an emetic must be employed; or an attempt must be made to evacuate the stomach by tickling the fauces with a feather.

If the menstrual or hæmorrhoidal flux have been suppressed, leeches should be applied to the vulva, or verge of the anus. When there is profound coma or collapse, we may apply liniment (Form. 34) to the nape, and strong ammonia to the nostrils, and use a stimulant enema (Form. 72). The hot air-bath, or stimulants, in such cases, have produced reaction; and when this happens, depletion may be necessary.

When apoplexy supervenes after a retrocession of gout or of acute rheumatism, brisk aperients should be given without delay.

If the patient swallow with difficulty, great care is required in giving food to prevent suffocation. While the difficulty lasts, medicines should be unirritating and not bulky, and nourishment be given by teaspoonfuls. The bowels should also be relieved by purgative clysters, and we must carefully anticipate retention of the urine.

When convalescence commences, we may insert a seton in the neck. On the repetition of the fit, we must again resort to the treatment required in the first attack, but in a less active form. When a patient suffers from sleeplessness and great irritability, opium is the appropriate remedy; but it is contra-indicated in the early stages of apoplexy.

In the treatment of apoplexy, in all its stages, we must not carry depleting measures to an extreme. Undue activity in this respect may lead to fatal consequences. Severe antiphlogistic measures are also decidedly contra-indicated in aged and feeble persons, in whom it will suffice to keep the bowels somewhat more open than usual, and to regulate the diet, giving wine and other stimulants, according to the state of the pulse.

PROPHYLAXIS.—As apoplexy depends on a determination of blood to the head, and generally on a plethoric habit, persons predisposed to the disease should abstain from fermented liquors, observe moderation in the use of animal food, and carefully avoid indigestible food. In some cases, a vegetable or milk diet must be insisted on; and on the recurrence of threatening symptoms, a greater strictness of diet, and purgatives; and if these do not remove the symptoms, dry cupping to the neck, or the abstraction of blood by cupping from that part, must be resorted to. Hot rooms and late suppers must be avoided. The patient should take regular exercise in the open air, be abstemious in his habits, keep the bowels free, and wear nothing tight about the neck or chest. When the disease occurs in persons of weak constitution, a light nutritious diet, with a moderate allowance of weak stimulants, combined with astringent chalybeates or acid tonics, should be persevered in. Mental labour must be abandoned, and all excitement avoided. For the treatment of paralysis following apoplexy, see Paralysis.

CHRONIC DISEASES OF THE BRAIN.

There are several chronic diseases of the brain, such as softening, atrophy, induration, hypertrophy. The symptoms and diagnosis of these diseases are extremely obscure and uncertain, and the same symptoms may be present in very different states of the organ.

In many cases chronic diseases of the brain are unattended with any symptoms which could lead us to suspect their existence. Thus, Louis states, that out of twenty cases of fungus of the dura mater, three only had cerebral symptoms of any kind: and abscesses, hydatids, cysts, exostoses, &c., sometimes attain great size, without any attendant symptoms of cerebral disorder.

I. *Softening of the Brain.*

Symptoms.—Those of failing intellectual and physical powers, gradually lapsing into imbecility. The gait becomes shuffling and unsteady, the grasp weak, the speech thick, slow, and imperfectly articulated (*aphemia*, *aphasia*), pointing, according to some observers, to the implication of the anterior convolutions of the brain, which rest upon the supra-orbital plates of the frontal bone. The memory is defective, and the animal functions torpid. A sensation of numbness and pricking affects the extremities of the weaker limbs. The radial and temporal arteries are seen and felt to be tortuous and hard. An " arcus senilis " frequently surrounds the cornea. The patient is liable to attacks of apoplexy. His spirits are usually depressed, and he sits down at one time listless and apathetic, and at another sheds tears without being able to assign any cause for his grief. More or less paralysis accompanies this condition.

Termination.—Sooner or later in serous or sanguineous apoplexy.

Morbid Anatomy.—Brain matter less vascular, softer and whiter than usual. Its softness is such that a gentle stream of water makes an impression upon it and after a time causes its diffluence. In extreme cases it is semi-fluid, and has little more consistence than cream. According to Dr. Todd, " the presence of great numbers of large cells, containing oily matter in large globules, and also in a state of minute subdivision, is characteristic of a state of white softening of some duration." In all cases the blood-vessels will be found diseased. The condition of the radial and other arteries may be taken as an indication of that of the carotid within the brain. Sometimes its primary branches will be found dilated, thin, and stiffened here and there by patches of atheromatous deposit; sometimes converted into moniliform osseous tubes. If the softened brain-pulp be washed away, a network of atheromatous or bony tubes will be left.

Cause.—Defective nutrition of the brain, resulting from disease of the coats of the blood-vessels. Partial softening is occasionally caused by the plugging of one of the large arteries or its branches by a clot of lymph detached from an inflamed cardiac valve, or derived from an aneurismal sac.

Prognosis.—Unfavourable.

Treatment.—Gentle exercise in dry temperate air, light nutritious albuminous diet, with a liberal allowance of wine. Dilute nitric and phosphoric acids in combination with bitter infusions, perchloride of iron and salts of zinc given for a week or two alternately. The patient should sleep with the head and shoulders slightly raised. All excitement, mental and physical, must be carefully avoided.

II. *Atrophy of the Brain.*

Shrinking of the cerebral hemispheres with complementary effusion of serum around it, or within its ventricles, is a condition very commonly found in those who have been insane.

III. *Induration of the Brain.*

Induration appears to be the result of chronic inflammation; the nerve tissue is harder than usual. In some cases the hardening is considerable, it is pearly white, less vascular than usual, and of the consistence of boiled white of egg. The induration may be partial or general. Convulsive movements are common in the course of the disease.

IV. *Hypertrophy of the Brain*

Is allied to hydrocephalus, and arises in those of scrofulous habit. The consistence of the brain is softer than usual, the convolutions flattened, and the ventricles diminished in size. The progress of the disease is marked by pallor, anorexia, listlessness, occasional headache and giddiness. The child is ultimately taken with convulsions which continue till death occurs.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES.

Myelitis	Inflammation of the Spinal Cord.
Spinal Meningitis . .	Inflammation of its Membranes.

Other Diseases of the Spinal Cord.

General Remarks.—While *hemiplegia* is the most obvious symptom of lesion of the brain, *paraplegia* is the most striking characteristic of injury to the spinal cord. In diseases of the brain the intellect and special senses are more or less implicated; in diseases of the spine they remain throughout altogether unaffected.

In the diagnosis of the seat of disease in the spinal cord, attention must be paid to the following facts:—

1. Complete transverse section of the posterior columns of the cord results in loss of power to regulate the movements of the parts below the section. Partial injury is followed by incomplete control over the muscular movements. Hyperæsthesia occurs in both cases in the parts below the section.

2. Transverse section of the antero-lateral column produces paralysis of motion in the parts below the section on the same side of the body.

3. Transverse section of the whole of the grey central nervous matter causes loss of sensation in all parts below the section. Transverse section of the right half of the grey matter results in loss of sensation of the left limb below the section, and hyperæsthesia in the right limb, and *vice versâ*.

4. Whence it follows that transverse section of one entire half of the cord causes in the parts below the section paralysis of motion with hyperæsthesia on the same side, and loss of sensation only, on the opposite side.

5. If inflammatory irritation be present in the seat of the disease, the paralysed limbs will be rigidly contracted. In non-inflammatory diseases, or when inflammation has passed away, the muscles will be flaccid.

MYELITIS—INFLAMMATION OF THE SUBSTANCE OF THE CORD.

SYMPTOMS.—Dull aching pain in the part affected, with some tenderness; loss of sensation and voluntary motion; or numbness and impaired sensibility, with feebleness of the upper or lower extremities, or of both, or of a single limb; or loss of sensation in one extremity, and of voluntary motion in another. The palsied limbs waste; but the reflex function remains intact. The muscles of the affected limb may be relaxed, contracted, or convulsed. Sooner or later, retention or incontinence of urine comes on, the motions pass involuntarily, and bed-sores are formed on the back and hips. At last the patient sinks exhausted, or dies comatose from the extension of the disease to the brain. The symptoms vary with the seat of the disease.

When the cervical portion of the spine is affected, the arms are paralysed, and there is difficulty in swallowing and in breathing, and a sensation of tightness around the chest, and in the epigastrium. The pulse is sometimes very slow. Priapism is often a troublesome symptom.

When the dorsal portion is affected, the body is sometimes agitated by continued convulsive motions, and there are palpitations, difficult respiration, and sense of constriction in the abdomen.

When the lumbar portion is attacked, the upper extremities and the breathing escape, but the lower extremities are paralysed; and there is retention, followed by incontinence, of urine, and constipation, followed by involuntary evacuations from the bowels. Impotence is sometimes a consequence of disease of this part of the spinal marrow.

In some cases the disease comes on insidiously, is unaccompanied by pain, and makes slow progress, but is finally succeeded by paralysis of the bladder, rectum, and inferior extremities.

MORBID ANATOMY.—Inflammation ending in hardening, creamy softening, or abscess of the cord, partial or complete.

CAUSES.—*Predisposing.* The adult age, and male sex.—*Exciting.* Blows and falls; violent exertions; exposure to wet and cold. Caries of the vertebræ; scrofulous disease. Venereal excesses.

DIAGNOSIS.—From other disease of the spinal cord, by the more complete loss of sensation in the paralysed parts. The grey matter is the conductor of sensitive impressions, and, being the most vascular part, it is most liable to inflammation.

PROGNOSIS.—Complete recovery is rare; but the disease may continue for years.

TREATMENT.—In the early stage, leeches or cupping to the part affected, followed by counter-irritation in the neighbourhood of the part, by blisters, issues, or setons. Aperient medicines; rest; constant attention to the state of the bladder, and scrupulous cleanliness, throughout the disease. The patient should lie upon a water-cushion. The general treatment must be adapted to the state and strength of the patient.

SPINAL MENINGITIS—INFLAMMATION OF THE MEMBRANES OF THE CORD.

SYNONYM.—Spinal arachnitis.

VARIETIES.—1. Acute spinal meningitis. 2. Subacute spinal meningitis or spinal irritation. 3. Rheumatic spinal meningitis.

1. ACUTE SPINAL MENINGITIS.

SYMPTOMS.—Pain in the part affected, increased by motion, percussion, pressure, or heat. The pain, which often closely resembles that of rheumatism, and is brought on, or increased, by motion, extends along the back, and to the limbs, which are sometimes painful to the touch; or it shoots round the abdomen or chest. There are contractions of the back and neck, and of the limbs, varying with the seat of the disease, and assuming the form of trismus, torticollis, partial or complete opisthotonos, or general tetanic spasms. Sometimes there are convulsions, or choreic movements. There is a sense of constriction in the neck, abdomen, or chest, with urgent feelings of suffocation. In some cases the urine is retained and the bowels are confined.

The disease generally proves fatal from the tenth to the fourteenth day, with delirium, coma, or typhous symptoms.

MORBID ANATOMY.—Inflammation of the arachnoid and pia mater, with effusion of serum beneath the arachnoid, or in the wide subarachnoid space between this membrane and the pia mater. In some cases inflammation and its consequences in the cord itself.

CAUSES.—Those of inflammation of the substance of the cord.

DIAGNOSIS.—The rigid spasm or convulsions, and in many cases by the affection of the bladder, distinguish this disease.

PROGNOSIS.—Less unfavourable than when the substance of the spinal marrow is inflamed; but attended with considerable danger.

TREATMENT.—Leeches, and cupping to the part affected, followed by active aperients, a strict antiphlogistic diet, and perfect rest, in the recumbent posture. The state of the bladder should be ascertained, and the urine, if necessary, frequently drawn off. After the bleeding, bladders of ice may be applied with great advantage. Counter-irritants may be, at the same time, applied in the neighbourhood of the part. Benefit will also be derived from the use of mercury, so as to affect the system. In collapse, the strength must be supported by diffusible stimulants and injections.

When the disease becomes chronic, and there is paralysis with shaking or stiffness of the limbs, counter-irritation by issues, setons, and moxas may be practised with advantage.

2. SUBACUTE SPINAL MENINGITIS—SPINAL IRRITATION.

SYMPTOMS.—Pain in the affected portion of the spine, increased by firm pressure, percussion, or heat. Pain in the left side, or under the false ribs, or in all the muscles of the chest, or acute muscular pain over the whole of the abdomen. Dyspnœa and palpitation. Hysteria, depression of spirits, irritability, disordered bowels, constipation, flatulence.

Sometimes these disorders, which are often of long continuance, are aggravated after marriage, but especially during lactation and pregnancy; the sufferer is constantly complaining of pains or unpleasant sensations of all parts below the affected vertebræ.

DIAGNOSIS.—On making firm pressure with the index and middle finger of the right hand on the vertebræ from the neck to the lumbar region, or striking the several vertebræ successively, we discover one or more painful points, and the pains in the side, chest, or abdomen are immediately increased; or darting pains in those parts are produced, if they did not previously exist. In some instances these superficial pains are accompanied by convulsive movements of the muscles of the trunk.

CAUSES.—*Predisposing.* The female sex. It is common in young females, and is sometimes associated with disorders of the spine.—*Exciting.* Sedentary pursuits, tight lacing, want of active exercise, constipation, painful menstruation, leucorrhœa; the original cause and the effect continuing to react upon and increase each other. Spinal irritation may exist in other diseases, as in spasmodic asthma and chorea.

RATIONALE.—The tender spine is the middle link between some remote irritation of the uterus or intestinal canal, and the pains in the muscles of the chest or abdomen. The irritation travels through the nerves of the part affected to the spine, where it first becomes sensible, and thence is reflected to the seat of pain. The connection of the muscular pain with the tender spine is evidenced by the effect of percussion in producing or increasing it; also in exciting convulsions when these are combined with the pain. In the more severe cases of spinal irritation, which closely border on acute spinal meningitis, pressure on the spine causes both acute pain and violent convulsive or tetanic movements, and the slightest pressure on the site of the reflected pain will also cause convulsions. Pressure or percussion on other parts of the skin, or on the spine above or below the affected part of the cord, are not attended either by pain or convulsions. (G.)

PROGNOSIS.—*Favourable.* The disease generally yields to treatment; but if neglected, it may assume the acute form, and so prove fatal.

TREATMENT.—I. *Local.* The application of leeches or cupping-glasses to the tender part of the back, followed by blisters or stimulant liniments. Emplastrum belladonnæ, or opii, will be needed in the relief of muscular pain.

II. *General.*—Disorder of the menstrual function must be relieved or removed by appropriate treatment. The bowels must be carefully regulated, and tonics and sedatives, of which henbane is the most serviceable, judiciously employed.

3. RHEUMATIC SPINAL MENINGITIS.

SYMPTOMS.—Diffused pain, often very acute, and accompanied by tenderness in the neighbourhood of the spine; with severe neuralgic pain extending the whole length of one arm or leg, according as the disease attacks the lower cervical and upper dorsal vertebræ, or those of the loins. After a time the pain and tenderness become limited to a single spot near the spine, on one side, which is found on examination red and tender, and, after a while, may become the seat of an herpetic rash. The pain in the extremity continues, and is attended with numbness and tingling of the fingers, with loss of power, or complete paralysis.

PATHOLOGY.—Rheumatic affection of the fibrous tissues of the spinal sheath, and of the tendons of the neighbouring muscles; with cutaneous inflammation of limited extent.

CAUSES.—*Predisposing.* Those of rheumatism and gout.—*Exciting.* Exposure to cold and wet. Fatigue.

DIAGNOSIS.—From muscular rheumatism by the local pain, and tenderness, and loss of power in the limb.

PROGNOSIS.—Favourable, but guarded.

TREATMENT.—Leeches to the tender spot, followed by warm fomentations ; and the appropriate remedies for rheumatism. (See p. 353.)

OTHER DISEASES OF THE SPINAL CORD.

Serous effusions occur within the spinal canal, as well as in the skull, and may be situate externally to the dura mater, or within it, or beneath the arachnoid membrane.

Extravasation of blood may occupy the same situations. It may be caused by falls, blows, or slips, or by violent efforts, as pulling on boots, drawing a cork, or raising a heavy load. Effusions of blood (*spinal apoplexy*) have also been found in cases in which no accident had occurred ; the symptoms being pain in the back, spasmodic contractions of the muscles, paralysis of the bladder, rectum, and lower extremities, convulsions, or coma, and death.

The membranes of the spinal cord may be thickened and indurated like those of the brain, and from the same causes ; and fungous growths form on the dura mater, causing pressure and paralysis.

The cord may also become firmer than natural, after congestion or inflammation. It is subject, in common with the brain, to atrophy and hypertrophy, to tuberculous deposits, and carcinomatous degeneration, to hydatids and to aneurismal and other tumours.

The *diagnosis* of all these affections is difficult and uncertain, the prognosis unfavourable, and the treatment chiefly palliative. When accompanied by inflammation, the treatment is that of Myelitis.

The spinal marrow is also liable, like the brain, to *concussion* and *compression*, induced by external injuries, whether inflicted on the back or by falls on other parts of the body. In severe concussion, reflex motions of the limbs cannot be excited. The treatment is similar to that employed in the same diseases of the brain.

A congenital malformation, known as *Hydrorachis*, or *Spina bifida*, consists in one or more fluid tumours on the lumbar, dorsal, or cervical vertebræ, communicating with the spinal canal. The tumour is variable in size, is often transparent, and the colour of the skin may be natural, reddish, or livid. If pressure be made on the tumour, it induces signs of compression of the brain. The limbs are imperfectly developed, and the rectum and bladder are often paralysed. The skin may be absent, and in this case the tumour is covered by the dura mater, pia mater, and arachnoid membrane; and the pia mater is congested and red. The spines, and usually the laminæ, of the corresponding vertebræ are wanting. In some cases the spines are separated along the median line, and are with the laminæ widely divergent. Occasionally there is a division of the medulla, or it is entirely absent at the seat of the tumour. The cavity of the arachnoid contains a serous, transparent, sanguinolent or purulent fluid, which may communicate with the brain; or be merely enclosed in the pia mater.

Attempts have been made to treat these tumours by pressure, or by pressure with repeated tappings with a fine needle; but both plans have proved ineffectual. When the integuments are wanting, or very thin, the tumours should be protected by a shield.

DISORDERS OF THE NERVES OF SENSATION.

NEURALGIA	Nervous pain.
NEURALGIA FACIEI	Tic Doloreux.
NEURALGIA HYSTERICA	Hysterical pain.
HEMICRANIA	(See Cephalagia, p. 362.)
SCIATICA	Pain in the sciatic nerve.
ANÆSTHESIA	Loss of sensation.

NEURALGIA—NERVOUS PAIN.

Pain is a symptom of almost all acute, and many chronic, diseases. When it is a distinct affection of the nerves themselves, it is termed neuralgia. It has its seat in the nerves of common sensation, but may affect those of organic life.

Neuralgia may arise from many causes. It is a common consequence of debility following prolonged lactation, long-continued and excessive discharges, or exhaustion from loss of blood. When confined to one side of the head and face, and intermittent, it may often be traced to the same cause as ague. In many instances, pain is due to some remote irritation, and is termed sympathetic. Pain in the shoulder, in affections of the liver, and pains in the upper arm in certain cases of diseased heart, are examples of this variety. Here there is a well-known connection between the nerves supplying the diseased organ and those going to the seat of pain. In other instances of sympathetic neuralgia no such connection exists. Thus, common tic doloreux has been traced to acidity of the stomach, to an overloaded state of the intestines, or to diseased kidney. Another class of cases may be traced to pressure or irritation at the root of a nerve. A spicula of bone, or fragment of a foreign body, irritating the nervous trunk, is a common cause of severe and inveterate forms of neuralgia. Pain in the glans penis, from stone in the bladder, pain of the thigh and testicle from irritation of the kidney, pain in the back of the thigh and leg, and at the verge of the anus, from constipation, and distension of the hollow viscera by gas, as in colic, and in severe flatulence, are examples of neuralgia from pressure, or direct irritation. Another interesting and important class of pains are *reflected* pains, generally situated in the parietes of the chest or abdomen, and very frequently in the left side. (See p. 356.) Pains of the internal viscera, without symptoms of inflammation, form another class of neuralgic affections. Intense neuralgia of an intercostal nerve generally precedes or accompanies herpetic eruption of the side. Gastrodynia, enterodynia, and hysteralgia, are examples of pain in the organic nerves of the stomach, intestines, and uterus. Wandering pains in the muscles are common in aged persons, and in younger men through hard work, or after severe illnesses. Inflammation of the neurilemma, another cause of neuralgia, combines heightened sensibility with pressure. In most cases, no change of structure can be detected in the nerve itself.

NEURALGIA FACIEI—TIC DOLOREUX.

DEFINITION.—Pain, with intervals of perfect ease, in some or all of the branches of the sensitive portion of the fifth or trifacial nerve.

SYMPTOMS.—The disease usually occurs in the middle-aged of both sexes. The pain is most acute, comes on at variable intervals, suffers considerable abatement, or entirely disappears without assignable cause for days, weeks, months, or even years together. It is at first confined to a limited spot, the supra-orbital, the infra-orbital, or the mental foramina, its most frequent seat being the right infra-orbital nerve. It is of the acute lancinating kind, compared to electric shocks; or it is a severe burning sensation. Sometimes pain is the only symptom, but generally there is some redness, heat, and swelling of the part affected. If the eye be affected, there is a large secretion of tears; if the mouth or jaw, a copious flow of saliva. After it has continued some time, it is apt to involve other branches of the nerve first affected. Thus, if it begin beneath the orbit, it spreads to the upper lip, and thence to the upper and lower jaw; and it may mount over the orbit, extend over the entire scalp, and even for some distance down the spine. The general health is very little affected; the patient, in spite of the most intense suffering, recovers his flesh and healthy aspect in a few days of intermission, and often attains a very advanced age.

CAUSES.—*Predisposing.* The female sex; pregnancy; the nervous temperament; anæmia; debility; fear, grief, or anxiety.—*Exciting.* Irritation of the root of the nerve within the cranium, or of one of its branches, from inflammation of the peridental membrane, or a carious tooth; or from pressure in the bony canal in which the branch lies. Rheumatic affection of the nerve.

DIAGNOSIS.—From *hemicrania*, and *brow ague*, by the seat and character of the pain.

TREATMENT.—We must first determine, whether the pain be due to local irritation. The sensitive branches of the trifacial nerve are peculiar in passing through long bony canals, and in being distributed to the teeth. Hence we must look for pressure, for inflammation of the peridential membrane, and for caries of the teeth. Stumps and carious teeth should be removed. If the pain be due to rheumatic affection of the sheath of the nerve, or of the periosteum lining the bony canals in which its branches run, it may be expected to yield to the appropriate remedies.

If the irritation be reflexed from the stomach, bowels, or kidneys, we must apply remedies for indigestion, constipation, and the renal affection.

In the anæmic condition, quinine and iron, alone or in combination, are generally successful. The best way of administering the quinine is in full and occasional doses. The most suitable form of iron is the saccharated carbonate and the peroxide; they may be given in doses of gr. xxx to l twice or thrice a day.

Hydrochlorate of ammonia in doses of 30 grains thrice a day is occasionally successful, especially when the pain is confined to the jaws.

The following local applications may be required in addition to the constitutional treatment:—1. The inhalation of a little chloroform. 2. Linimentum chloroformi, linimentum belladonnæ, or a mixture of equal parts of chloroform and laudanum, may be rubbed into the gums, or over the painful nerve. Veratria and aconitia ointments are often very serviceable.

In a case of tic doloreux of many years' standing, which had spread from the right infra-orbital nerve to the upper and lower jaw, over the scalp and down the spine, accompanied by excruciating suffering, after tonics and narcotics, bleeding, blistering, and salivation, had been tried in vain, and nothing afforded any relief; a stream of cold water poured upon the forehead, and allowed to trickle over the face and neck, procured refreshing sleep after the lapse of about five minutes, had the same effect on a repetition, was followed by the first good night the patient had had for weeks, and by a long interval of comparative ease. In this case the paroxysms were always accompanied with determination of blood to the parts affected, and increased heat of surface. Where these characters are absent, cold may be expected to prove less efficacious. This patient died ætatis 76, having been a great sufferer for at least 25 years. (G.)

NEURALGIA HYSTERICA—HYSTERICAL PAIN.

Many women of hysterical temperament are subject to severe neuralgia. It may affect any part of the body. Occasionally it has its seat in a particular joint or bone. There may be no evidence of local or constitutional disease. The pain appears in many cases to be purely imaginary; in all it is more or less superficial, and is absent or diminished when the patient's attention is diverted from it. Rough handling gives no more pain than the slightest touch, but of the reality and occasional severity of the disease there can be no doubt. E. G., a healthy unmarried woman of about forty years of age, complained of intense and constant pain in one knee; there was no evidence of the least disease. Every kind of counter-irritation and constitutional treatment was adopted. After repeated treatment as an in-patient in the infirmary, the surgeon at last yielded to her importunities, and amputated the leg. The knee-joint was perfectly healthy, and no disease of its nerves could be detected. Two years afterwards, she came again under treatment for similar pain in her other knee. She entreated the surgeons one after another to amputate this leg also, but they did not yield a second time to her solicitations.

In another case the pain was limited to a small spot in the front of the tibia; the pain was so acute that the surgeon supposed there was an abscess in the bone, and trephined, but no disease was met with. Soon after the operation the pain returned in the part, and continued for more than a year, at the end of which time the surgeon yielded to her wish, and amputated the leg. No cause for the pain could be detected. These cases show that the pain, originating, perhaps, in some trifling or even imaginary disorder of sensation, eventually becomes real and severe; and they serve, at the same time, to remind us that there are certain affections of the nervous system, of the causes of which we are as yet ignorant. The shower-bath as a constitutional remedy, and the light application of the actual cautery in lines to the affected part, are the most hopeful means of relief.

SCIATICA.

Symptoms.—Acute aching or darting pain along the course of the sciatic nerve from the nates to the knee, or even to the ankle; generally increased by firm pressure in the track of the nerve.

Causes.—The pressure of accumulated fæces, or of tumours on the nerve. Syphilitic or rheumatic affection of its sheath.

Diagnosis.—From *muscular rheumatism* by the pain being limited to the course of the nerve, and being little, if at all, affected by the motion of the limb. In sciatica dependent on constipation, the pain is generally increased by every effort to relieve the bowels.

Treatment.—The warm or vapour bath. Friction. Aperient medicines so administered as to keep the bowels free. The general and local remedies recommended in neuralgia faciei.

I have seen several cases unrelieved by the remedies usually given in neuralgia, speedily cured by a few doses of compound colocynth pill, followed by black draughts. (G.)

ANÆSTHESIA—LOSS OF SENSATION.

VARIETIES.—*Anæsthesia*, paralysis of the nerves of sensation; *amaurosis*, of the retina; *cophosis*, of the auditory nerves; *anosmia*, of the olfactory nerves; *ageustia*, of the gustatory nerves.

Anæsthesia, or loss of common sensation, may occur separately or with palsy of the voluntary muscles; it may be general or partial, affecting one side or both. Facial anæsthesia is a well-known form of this disease. Numbness, in the hands and forearms, is not an unfrequent symptom in Mimosis inquieta. (See p. 264.)

The TREATMENT must entirely depend on the pathological condition by which the disease is induced—if by pressure, the cause must, if possible, be removed; if by deficient supply of blood, stimulants must be resorted to; if by cold, the circulation must be restored. In other cases the treatment will be that of the diseased conditions with which it is associated. It is rare as a separate malady.

ANÆSTHESIA FACIEI.

SYMPTOMS.—Numbness or total loss of sensation in the forehead, cheek, nose, and chin, on one side of the face; also in the lips, tongue, inside of the mouth and nose, and surface of the eyeball, generally accompanied by paralysis of the temporal and masseter muscles on the same side. This loss of sensibility is sometimes attended by intense pain of the parts affected.

TERMINATIONS.—In some cases ulceration of the cornea and destruction of the globe of the eye.

PATHOLOGY.—Injury to the fifth pair of nerves by disease, compression, or mechanical injury.

PROGNOSIS.—*Favourable*, in the absence of anæsthesia or palsy of other parts. *Unfavourable*, if complicated with disordered functions of other cerebral nerves, or with symptoms of disease of the brain.

TREATMENT.—Local depletion by cupping or leeches to the temples, followed by fomentations. The internal use of mercury, so as slightly to affect the gums. If the disease, in spite of this treatment, become chronic, small blisters in front of the ear, kept open by savin ointment.

DISEASES AFFECTING THE NERVES OF VOLUNTARY MOTION.

Paralysis.
Facial Palsy.
Lead Palsy.
Paralysis of the Insane.
Wasting Palsy.
Locomotor Ataxy.
Tremor Mercurialis.
Paralysis Agitans.
Epilepsia.
Catalepsia.
Chorea.
Tetanus.
Hysteria.
Hydrophobia.

PARALYSIS—PALSY.

Paralysis, although only a symptom of disease, may, like dropsy, be conveniently considered under a distinct head.

Varieties.—1. Hemiplegia; 2. Paraplegia; 3. General Paralysis; 4. Partial Paralysis (including Paralysis of the Facial Nerve, Ptosis, &c.); 5. Lead Palsy; 6. Paralysis of the Insane; 7. Wasting Palsy.

1. HEMIPLEGIA.

Definition.—Loss of motion, or of motion and sensation, of one lateral half of the body.

Varieties.—The late Dr. Todd distinguished five varieties of hemiplegia, viz., Cerebral, Spinal, Epileptic, Choreic, Hysterical, and Peripheral.

Symptoms.—In cerebral hemiplegia, the limbs of the affected side, if raised, fall by their own weight; the face on the same side is relaxed and void of expression, and drawn to the sound side; the tongue deviates towards the palsied side; the speech is either lost, or it is thick, muttering, and unintelligible. In rare instances, the mouth is drawn to the affected side, and the tongue protruded towards the sound side. Digestion is more or less imperfect. The loss of power is generally accompanied by anæsthesia, but in a few instances with hyperæsthesia; the temperature of the affected side is generally diminished, but occasionally elevated. The mental faculties are sometimes unimpaired; but they frequently suffer, as shown by impaired memory, confusion of thought, inattention, irritability of temper, and depression of spirits. The pulse is often infrequent, but sometimes accelerated: the respiration is slow. The bowels are generally inactive. If the patient do not speedily recover, the palsied limbs shrink and grow cold. When the disease is partial, the arm is more commonly affected than the leg. If the power of the limbs be impaired, but not lost, the arm will be raised with difficulty, and often not without the assistance of the other, the hand cannot grasp firmly, the leg will be dragged after the sound limb, and in walking the patient will be very liable to trip. In cases of recovery the leg regains its power first; so that the patient can walk about, while the upper extremity still remains palsied; but to this rule there are many exceptions.

Hemiplegia is most common on the left side. It usually occurs suddenly, constituting the "paralytic stroke."

Spinal hemiplegia.—In this very rare form the face and intellect are unaffected.

Epileptic hemiplegia.—After an epileptic fit, the limbs of one side occasionally remain paralysed for a few minutes to a few hours, or for three or four days, or even much longer. Recovery takes place before the next attack.

Choreic hemiplegia sometimes occurs on that side of the body which is most affected by the choreic movements.

In *Hysterical hemiplegia* the palsy is incomplete, and limited to an arm or a leg. In walking the leg is dragged along the ground.

Peripheral hemiplegia.—Dr. Todd has given this term to those partial paralytic affections which commence with sensations of "needles and pins" in the fingers or toes, and gradually creep upwards, and more or less completely involve the extremities. The affection is occasionally paraplegic. This is the *Creeping palsy* of Dr. Cheyne.

CAUSES.—Sudden and *complete* hemiplegia, or the "paralytic stroke," is invariably caused by an apoplectic seizure. Whenever the right corpus striatum, or any part of the motor tract intervening between it and the medulla oblongata, is ploughed up by sanguineous effusion, or subjected to pressure from effusions or tumours in its neighbourhood, complete hemiplegia of the left side of the body must of necessity result. If the disease come on slowly, it is the result either of a growing tumour or of softening of the nerve tissue. In the latter case, it is possible that a weakness and numbness of the one side of the body may suddenly lapse into a complete hemiplegia from sudden lesion of the softened fibres without hæmorrhage.

Incomplete hemiplegia is the result of pressure or lesion of one side of the spinal cord, immediately below the decussation of the antero-lateral columns. The paralysis of motion is on the same side as the lesion, the paralysis of sensation on the opposite side.

DIAGNOSIS.—Even in mild cases, cerebral hemiplegia is always associated with more or less paralysis of the face and tongue. In more severe cases the intellect is disturbed, speech is imperfect or obsolete, deglutition is more or less difficult.

In spinal hemiplegia, the head, face, and tongue are unaffected, and sensation is impaired on the opposite side to the paralysis of motion.

Epileptic hemiplegia is of cerebral origin, and may be known by the history of the case.

Choreic hemiplegia is usually associated with some slight jerking movements of the paralysed limbs; the face is unaffected; the tongue does not deviate, and is usually protruded and withdrawn in a characteristic manner.

Hysterical hemiplegia is known from choreic, by the presence of hysterical symptoms, or their previous existence.

PROGNOSIS.—*Favourable.* Youth; a recent, partial, and incomplete attack, without cerebral symptoms; a return of sensation, tingling, and increased temperature.—*Unfavourable.* In proportion to the age, the duration of the disease, and the degree of paralysis.

With a view to more correct diagnosis and prognosis, the late Dr. Todd arranged cases of cerebral hemiplegia into three classes.—1. Those in which the muscles of the paralysed limbs are completely relaxed, the limbs being loose and flaccid, and the muscles wasted.—2. Those in which the paralysed muscles exhibit a certain amount of rigidity from the moment of the attack or soon after. The muscles retain their plumpness and the limbs resist extension.—3. The cases in which the wasted and relaxed muscles acquire, after some time, more or less tension, becoming shortened and feeling like tight cords. From these various states of the muscles he has drawn inferences as to the nature of the lesion. The phenomena presented by the first class result, he considers, from white softening of the brain. Those of the second class are caused by irritation of healthy brain tissue in the neighbourhood of the clot at the time of its formation, and subsequently during its absorption and the contraction of the wound. The muscular phenomena of the third class result from lesion of softened nerve-fibres, with or without the formation of a clot, the late rigidity resulting from the irritation caused by slow cicatrization of the wound, the process being attended by a dragging upon the healthy brain substance in its neighbourhood, and the irritation thus set up being conveyed to the muscles, results in gradual contraction.

2. PARAPLEGIA.

DEFINITION.—Loss of motion, with more or less impairment of sensation of both sides of the body. Only the lower half of the body may be affected; or the whole of it except the head; or the head not excepted, coupled with complete insensibility (coma).

The term paraplegia is usually limited to paralysis of the lower half of the body, but we here give it its unrestricted signification.

VARIETIES.—1. Organic, functional, or reflex. 2. From constitutional disorder.

SYMPTOMS.—Like other forms of paralysis, organic paraplegia may occur either suddenly or gradually. Sometimes it is complicated with head symptoms, but more frequently these are absent. The extent of the paralysis will depend on the seat of the lesion. (See p. 368.) When the disease affects the lower part of the cord, and the paralysis is complete, there is entire loss of sensibility and motion in the lower extremities, with palsy of the bladder and rectum. The patient being confined to the horizontal position, the back and sacrum are apt to slough. The retained urine is generally highly ammoniacal, and ultimately becomes bloody. It is prone to form calculous deposits.

In less complete forms of paraplegia, there is weakness of the legs, with a sensation of stiffness and heaviness, numbness, tingling, or formication, and an awkward, straggling, tottering gait. These symptoms gradually increase till perfect paraplegia, with paralysis of the bladder and rectum, results. In many cases the disease does not prove fatal till it has involved the arms and chest and the muscles of respiration. If the disease extend still higher into the cervical region, the roots of the phrenic nerve become involved, and life then necessarily ceases. In many cases of paraplegia, and especially in the more complete forms, the reflex function remains intact, and irritation of the sole of the foot occasions involuntary contractions of the muscles. Sometimes these reflex movements are very troublesome, the limbs being affected for many hours together with clonic spasms. In the paraplegia resulting from spinal concussion reflex movements are absent.

Causes.—Injuries to the spinal cord. Chronic disease of the cord or of its membranes; increasing pressure from growing curvature of the spine; caries of the vertebræ and relaxation of the spinal ligaments; pressure on the descending aorta.

Functional paraplegia has many causes, amongst which the most common are intense cold, excessive sexual intercourse, masturbation, and the syphilitic poison—a frequent cause of organic disease. Many cases of incomplete paraplegia have been referred to nervous action, and have been termed accordingly "*Reflex paraplegia*," or "*reflex paralysis*." Gonorrhœa, stricture of the urethra, nephritis, cystitis, uterine diseases and displacements, dysentery, dentition, and even irritation of the cutaneous nerves, have been advanced by various authors as causes of reflex paraplegia. The paralysis is supposed to be due, in such cases, to the arrest of the circulation in the spinal cord, from contraction of its blood-vessels, the contraction being produced by an irritation transmitted from the nerves of the diseased or irritated surface to the nerves of the blood-vessels distributed to the cord. The arguments in favour of such a theory are as follows:—1. Dr. Brown Séquard noticed contraction of the vessels of the pia mater of the cord on applying a ligature to the hilus of the kidney, or to the blood-vessels and nerves of the supra-renal capsules. 2. Violent rigors and even convulsions (affections generally recognised as due to reflex irritation) occasionally attend catheterism or dilation of the cervix uteri. 3. The absence of anatomical lesions of the cord in such cases of functional paraplegia as have been examined.

Prognosis.—*Favourable*, in cases of functional disorder; but *highly unfavourable* in cases of actual disease of the spinal cord or brain. In the most favourable class of cases recovery is generally slow, occupying weeks or months; and, in unfavourable cases, the patient may linger for years.

TREATMENT.—The *indications* are: I. The use of remedies appropriate to the diseased condition on which the palsy depends. II. The use of remedies calculated to act directly on the parts affected; and, III. The relief of incidental symptoms.

I. For the first indication, see Apoplexy, Myelitis, Spinal Arachnitis, and other diseased conditions of the brain and spinal marrow.

When the disease has become chronic, and all inflammatory symptoms have disappeared, we may resort to the astringent chalybeate tonics, such as the perchloride of iron; to the mineral acids; to *quinine* when the system will bear it. In paralysis from cerebral apoplexy we must intermit its use; if it produces headache, and heat of head, &c., *Strychnia*, in doses of $\frac{1}{30}$ to the $\frac{1}{15}$ of a grain, two or three times a day, cautiously increased, may be given with advantage. Its action on the system is indicated by twitchings of the paralysed muscles, but these taken as indications of returning power are delusive, as they depend on an affection of the excitomotory nerves. The same remedy may be applied locally, $\frac{1}{8}$ of a grain being sprinkled on a blistered surface, near the origin of the paralysis. *Tincture of cantharides* (Form. 23) is useful in some cases of paraplegia, especially in that form which depends on disease of the urinary organs. It stimulates the bladder to more healthy action, and in cases dependent on effusion into the sheath of the spinal marrow, may act favourably as a diuretic. *Oil of turpentine*, in drachm doses, suspended in mucilage, may also be given with advantage in the same cases in which cantharides is beneficial.

Paralysis from constitutional disease or reflex action must be treated according to the cause. (See Syphilis, Hysteria, &c.)

II. This indication is fulfilled by friction with the flesh-brush, or stimulating liniments; by blisters; the actual cautery; electricity. To apply electricity we must include the part we wish to operate upon between the two conducting wires of the battery, one wire or electrode being placed on the affected part, and the other upon the nerve-centre or nerve-trunk corresponding to the affected organ. The muscles are excited through the skin. Electricity may be applied in the following modes:—1. By the *electric hand.* One electrode consists of a moistened sponge, inclosed in a metallic cylinder, and this is placed upon a point of surface which is not very excitable; the operator holds the other electrode in one of his hands, and then rapidly passes the back of the other over the parts he wishes to excite, after having dried the skin of the patient with starch, or lycopodium.—2. By including the part to be excited between two electrodes composed of sponge soaked in salt and water, and inclosed in metallic cylinders.—3. By including the part between two solid metallic electrodes, cylindrical or conical, and moving them rapidly over the affected parts.—4. By the *electric brush;* the moist sponges being replaced by a brush of fine metallic wires.—5. By placing the two hands or two feet each into a basin of water, and plunging into each vessel one of the electrodes of the battery. It will be obvious that the nervous centres must be stimulated in this last process. The magneto-electric battery is the most appropriate kind for generating currents for medical purposes.

In using electricity, we must bear in mind the fact that, when the current is intense, and its action prolonged in the same direction, the excitability of the nerves of the part is much enfeebled. When, therefore, we wish to increase the vitality of the nerves, we should use only feeble currents, guided alternately in opposite directions. But, at the same time, the velocity of the intermittencies should always be great, because by this means the contraction of the muscle is maintained, and its force at the same time increased. We are thus enabled to imitate the voluntary motions. Slow intermittencies only produce trembling. In anæsthesia, the most intense currents are powerless in rousing sensibility if they do not succeed each other with great rapidity. In the treatment of muscular atrophy, we must also use currents with rapid intermittencies. The rapidity of the intermittencies is in direct proportion to the number of the rotations of the armature in front of the magnet.

The cases of paralysis in which electricity is beneficial, are those resulting from apoplexy of the brain or cord; but on no account must it be used till all irritation has ceased in these nervous centres—until, in fact, the clot has been absorbed and cicatrization effected. The absence of pain, and a lax condition of the paralysed muscles, will be our best indications that these have been effected.

In addition to electricity, we may use salt-water baths, shampooing, the warm or hot-water *douche*, and, when the power of the extremities has in some degree returned, exercise. These remedies also are inapplicable in the early stage of the paralysis which depends on acute disease of the brain or spinal cord. They should not be resorted to till inflammation has ceased, and the disease has become chronic.

III. When the bladder and rectum are involved, the catheter should be used at least once a day; and if the urine become ammoniacal or bloody, the bladder should be washed out with warm water after the use of the catheter. Bed-sores must be carefully prevented by the use of the water-bed, and by rigid attention to personal cleanliness.

3. PARTIAL PARALYSIS.

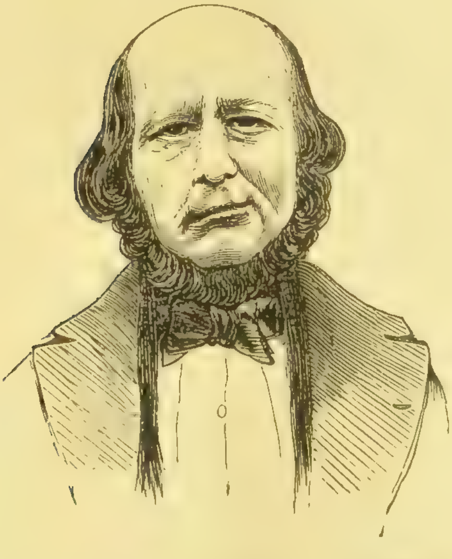
Particular muscles or groups of muscles are subject to paralysis from injury of the root of the trunk of the nerves distributed to them. The muscles of expression are very liable to this affection. Injury or disease of the motor portion of the fifth nerve, gives rise to a less common form of partial paralysis. *Strabismus* may be caused by palsy of one or more of the muscles of the eye. The paralysis of the superior branch of the third or motor oculi nerve occasions falling of the upper eyelid and closure of the eye (*ptosis*); and disease of the facial nerve entails, as one of its consequences, an open state of the eye due to paralysis of the orbicularis palpebrarum (*lagophthalmia*); paralysis of the laryngeal nerves occasions *aphonia;* and paralysis of the hypoglossal nerve, loss of speech.

PARALYSIS OF THE FACE.

The *motor* nerves of the face being the portio dura, and the lesser root and third division of the fifth, and the *sensitive* nerves the first and second divisions, with the ganglionic portion of the third division, of the fifth nerve, it is easy to trace facial paralysis to its source. In perfect paralysis of the face, the portio dura and motor branch of the third division of the fifth suffer jointly: when the latter only is affected, the motions of the jaw on that side are paralysed, and in this case there is usually some loss of sensibility; but as the disease is confined to the muscles employed in mastication, there is no distortion of feature, beyond a flattening of the affected side of the lower jaw, and of the temple.

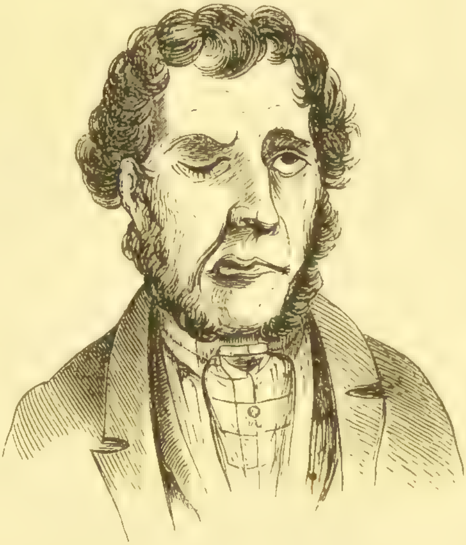
SYMPTOMS.—In palsy of the muscles supplied by the facial nerve, the expression is very characteristic. The features are drawn to the sound side, so that it appears shorter and narrower than the paralysed side. The two sides of the face wear so different an expression that the patient is said to laugh on one side and cry on the other. He is unable to frown on the affected side, and when desired to shut the eyes, the eye of the sound side is firmly closed, while that on the palsied side is either partially closed or remains wide open, the pupil, at the same time, being rotated upwards or inwards. In sniffing, the nostril of the affected side collapses; in blowing, the air escapes from the paralysed side. The saliva dribbles from the palsied side, and the food either slips from the mouth, or collects between the teeth and palsied cheek, which is often bitten. The power of whistling is also lost, and when the patient speaks, laughs, cries, sneezes, or coughs, the deformity is increased, the paralysed side remaining motionless, while the sound side is strongly contracted. The cheek on the affected side is flaccid, and swells during strong expiration. The labial consonants, *b*, *p*, and *f*, are imperfectly sounded; but the patient can speak distinctly when the lower lip on the affected side is supported by the finger. The sensation of the affected side is generally unimpaired.

Fig' 50.



The above woodcut (Fig. 50) shows the expression of the face in a patient of King's College Hospital, suffering from this disease. The right side is the seat of the paralysis; and the two sides present the striking contrast just described, the right having a sad, and the left a merry, expression—a difference readily perceived by covering one side of the face and then the other.

Fig. 51.

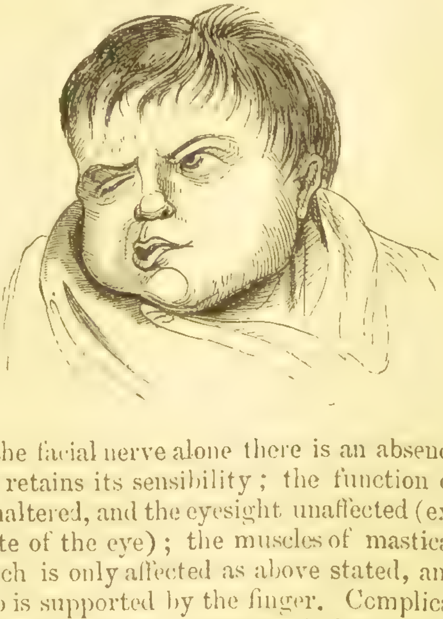


The second woodcut (Fig. 51) is taken from a sketch of another patient of King's College Hospital. It shows the expression of the face when a patient so affected is desired to shut the eyes. In this instance the left side is the seat of the disease; and the eye of that side cannot be closed, while the right eye is firmly shut. The whole face is drawn forcibly to the sound side, and all the features of that side are strongly contracted.

Fig. 52 exhibits paralysis of the left facial nerve in a child, with nability to close the left eye.

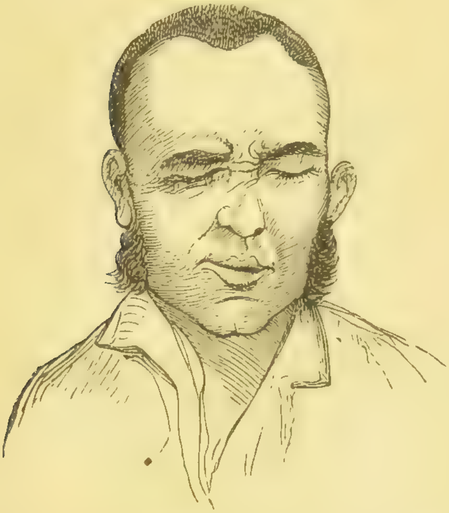
These illustrations of paralysis of the facial nerve may be advantageously compared with the woodcut (Fig. 53), which shows the state of the face in a well-marked case of hemiplegia affecting the left side. The eyelids of the paralytic side are closed, though less firmly than those of the sound side, while the features of the two sides present the same contrast, though in a less degree, than in Figures 50 and 51. (Figures 52 and 53 are taken from Marshall Hall's Principles of Medicine.)

Fig. 52.



DIAGNOSIS.—In paralysis of the facial nerve alone there is an absence of cerebral symptoms; the face retains its sensibility; the function of hearing is intact; the pupil is unaltered, and the eyesight unaffected (except as the result of the open state of the eye); the muscles of mastication retain their power; the speech is only affected as above stated, and is distinct when the paralysed lip is supported by the finger. Complication with deafness would show that the other division of the seventh nerve was affected; the addition of anæsthesia that the fifth nerve was also implicated; and cerebral symptoms would indicate that the seat of the disease affecting the nerves was within the skull and not external to it. Hemiplegic paralysis is known by disorder of innervation in the limbs.

Fig. 52.



PTOSIS, or closure of the eye from palsy of the superior branch of the third nerve, is regarded as a more serious disease than palsy of the facial nerve, being more probably due to intercranial disease.

PROGNOSIS. — *Favourable.* When the paralysis does not extend beyond the parts supplied by the facial nerve. The disease is often cured in about three weeks or a month.—*Unfavourable.* Complication with paralysis of other nerves, or with disease of the brain.

Sequelæ.—Inflammation of the conjunctiva, and in rare cases, ulceration of the cornea, and destruction of the eye of the affected side.

CAUSES.—Tumours within the cranium, or disease involving the root of the nerve; but intercranial disease is very rarely indicated by facial paralysis alone; deafness on the same side is, at least, a necessary concomitant of internal disease. Wounds and mechanical injuries. Disease of the petrous portion of the temporal bone in the vicinity of the tympanum. The caries resulting from scarlet fever often erodes the wall of the Fallopian canal, and the nerve, being laid bare, is involved in the disease and loses its function. The pressure of tumours, especially of the parotids; effusions into and around the sheath of the nerve. Cold.

TREATMENT.—If intercranial disease be the cause of the palsy, and febrile symptoms be present, cupping or leeches behind the ear, followed by a blister to the same part. Iodine and mercury.

Parotitis must be treated as recommended under that affection. Caries of the internal ear, by daily injections of warm water, followed by weak solution of sulphate of zinc, by tonics, and attention to the general health.

LEAD PALSY—DROPPED HAND.

SYMPTOMS.—The hands are generally first affected, and in some cases the forearm also suffers. The disease begins by weakness in the fingers, extending to the wrists, but rarely beyond them. There are at the same time shooting pains in the forearms, arms, and shoulders. The parts affected, after a time, waste from disuse, and the hands drop powerless at the wrists. The disease is generally preceded by one or more attacks of colic, but may occur independently of it.

DIAGNOSIS.—The history of the case. The seat of the palsy, assisted, in many cases, by the discovery of a blue line on the gums.

PROGNOSIS.—Favourable in first attacks and in slight cases. In some cases recovery after prolonged treatment. In others incurable.

CAUSES.—The employments of the plumber and glazier, oil-painter, and enamel-card makers. Fishmongers who use lead counters, men employed in lead-works, and persons who drink cider made by presses repaired with sheet-lead. Water kept in new leaden cisterns, or conducted through leaden pipes, the danger being, as a general rule, in proportion to the purity of the water.

PATHOLOGY.—The presence of lead in the blood and nerve tissue.

TREATMENT.—This must be directed to two objects. I. To eliminate the poison from the system. II. To rouse the paralysed muscles to action. To attain the first object we may give iodide of potassium in five-grain doses. Sulphur baths (Form. 335), or in the form of vapour. The second object may be attained by the use of electricity, shampooing, friction with the flesh brush, or with stimulating liniments; and by the internal administration of strychnia (Form. 19). Electricity is a very valuable remedy in this disease; the current should be a feeble one and the intermittencies very rapid. It should be passed in succession through individual muscles.

PROPHYLAXIS.—In lead-work, the use of a respirator of moist flannel. Scrupulous washing of the hands.

4. PARALYSIS OF THE INSANE.

This is a form of progressive paralysis attendant upon gradual loss of mental power. It first appears in the tongue, causing indistinctness in the speech and faulty or stammering pronunciation; it affects the muscles of both sides of the face, impairing the power of expression, and thence extends to the whole of the muscular system. The commencing palsy of the legs is indicated by slight lameness and occasional tripping, and that of the arms by the frequent dropping of food and other objects from the hand. The progress of the disease is gradual, but it terminates at length in complete paralysis, with palsy of the bladder and sphincter ani, of the muscles of deglutition, and of the respiratory muscles. The patient often dies asphyxiated. The sensibility is little impaired. The common duration of this malady is four or five years. The palsy of the muscles is accompanied by loss of mental power, the patient becomes imbecile.

DIAGNOSIS.—In the early stage, the youthful appearance caused by the relaxation of the wrinkles of the features; and, in an advanced stage, the peculiarly vacant expression of the whole countenance and the wide open eye are very characteristic. In Sir Alexander Morison's work on Insanity, these changes of expression are well shown in the same patient in an early and advanced stage of the disease.

PROGNOSIS.—This form of disease is dependent on progressive softening of the brain, and does not admit of cure.

TREATMENT.— That of Cerebral Softening (see p. 378).

5. WASTING PALSY

Is a form of partial or general paralysis, slowly progressive, and invading particular groups of muscles, or the whole of the muscular system. The affected muscles slowly weaken and waste until they are reduced to pale cords streaked with fat, or to mere bands or membranes composed chiefly of fibrous tissue.

The muscles of the upper extremity appear to be most liable to the disease, and of these the muscles of the ball of the thumb are most commonly affected, and the hand is robbed of its muscular masses, and resembles the foot of a bird—the "main en griffe" of French writers. When the muscles of the face are affected, expression is lost, and, but for the motion of the eyes, the countenance is as fixed as that of a statue.

The brain is unaffected, and the general health good. The disease is often traceable to injury either of a particular nerve trunk or of the spinal cord itself. The anterior roots of the spinal nerves are often found to be atrophied.

The only treatment likely to be of service is galvanism.

6. LOCOMOTOR ATAXY—TABES DORSALIS.

This and other names have been given to a derangement of the lower extremities not amounting to paralysis, but consisting of a want of co-ordinating power. The muscular contractions are still, to a certain degree, obedient to the will, nor is there want of power; but the movements are clumsy and uncertain, and the patient cannot walk steadily unless he *looks* at his legs in order apparently to guide their movements. He has great difficulty in rising from his seat, and in turning round is apt to fall; the gait is clumsy, hurried, and staggering. The disease may affect the muscles of the upper extremities when the movements of the arms and hands become awkward and fumbling.

Diminished sensation is a constant attendant upon this condition of the limbs, and is generally proportionate to the want of co-ordinating power.

In some cases there are evidences of impairment of mental power, but usually the mind is clear; and excepting slight defect of sight and hearing, the brain appears healthy.

Dr. Todd attributed this condition to disease of the posterior columns of the cord, but the pathology is still very obscure.

In the treatment some good may be expected from the judicious use of galvanism and alterative tonics.

TREMOR MERCURIALIS—MERCURIAL TREMORS.

SYMPTOMS.—This disease usually shows itself first by weakness in the arms, which gradually increases. It is accompanied by slight convulsive twitchings, followed by tremors, increasing in violence till the patient is obliged to abandon his occupation. The trembling gradually extends to the lower extremities, and at length to the entire body. It is brought on by every attempt to move, but it ceases when the limbs are supported, and the body is at rest. The patient dances rather than walks; he is unable to grasp objects; his speech is hurried and abrupt, and in extreme cases he cannot even masticate. If the patient continue to expose himself to the poison, restlessness, sleeplessness, and delirium supervene. Salivation is only occasionally present. The general health is impaired, and there are nausea and anorexia, a dry skin and a furred tongue; but there is no disorder of the circulation or respiration, and no colic. In very mild cases, especially when they occur in women, the symptoms are those of Mimosis Inquieta (see p. 264).

Among the minor effects of working with mercury may be mentioned a peculiar brittle state of the teeth, causing them to chip constantly, and exposing them to early decay.

DIAGNOSIS.—From *paralysis agitans*, by the history of the case, and the absence of trembling when the limbs are supported.

PROGNOSIS.—Favourable when the cause is excluded.

CAUSES.—The process of water-gilding; employment in quicksilver mines; long exposure in any way to the fumes of mercury, or to the absorption of the oxide by the skin.

TREATMENT.—A temporary cessation of employment; a combination of tonics and sedatives; preparations of iron; a generous diet, with a moderate allowance of wine; the shower-bath.

Prophylaxis.—Cleanliness and free ventilation of workshops. In those who inhale mercury, an arrangement by which the fumes can be carried off, such as a funnel terminating in a chimney; eggs swallowed two or three times a day; the free use of milk as an article of diet; in those who handle mercury, the use of gloves.

PARALYSIS AGITANS—SHAKING PALSY—THE TREMBLES.

Symptoms.—Weakness and trembling, usually commencing in the hands and arms, but sometimes in the head, and gradually extending over the whole body. At length, the trembling becomes incessant; and when the patient attempts to walk, "he is thrown on the toes and fore part of the feet, and impelled unwillingly to adopt a running pace, being in danger of falling on his face at every step." In a still more advanced stage, the shaking continues during sleep; the patient cannot carry food to the mouth; and mastication and deglutition are performed with difficulty. The agitation at length becomes so violent as to prevent sleep; the body is bent forward, with the chin upon the sternum; articulation is impaired or entirely lost; the urine and fæces pass involuntarily, and coma and slight delirium close the scene. In some cases, the muscles of respiration are affected, and the breathing becomes extremely frequent. (In one case occurring in a vigorous young man, 73 in the minute, with a pulse of 72.—G.)

Diagnosis.—Tremor, and a shuffling, hurried gait.

Prognosis.—Unfavourable in old persons. Less unfavourable when, as in rare instances, it occurs in persons in the vigour of life.

Causes.—*Predisposing*. The male sex, advanced age.—*Exciting*. Violent exertion, mental or muscular; cold; rheumatism.

Treatment.—In persons advanced in life, a combination of stimulants and sedatives is indicated. Conium and henbane are useful in the early stages; preparations of iron and galvanism in the latter.

EPILEPSIA—EPILEPSY.

Synonym.—Falling sickness.

Definition.—Fits recurring at irregular intervals, with sudden loss of sense and power of motion, frequently preceded by a shriek, attended by general convulsions, and usually followed by coma.

Symptoms.—The patient is seized suddenly, or after a short warning, with loss of consciousness and of power, so that, if he be standing, he suddenly falls, or is thrown to the ground. The fit, which is frequently preceded by a loud, piercing cry, consists in strong convulsive motions of the limbs and trunk, and various distortions of the countenance. The brows are knit; the eyes fixed and staring, or turned up beneath the lids; the pupils are dilated and do not contract when exposed to light. The hands are firmly clenched, and the arms are tossed about. The breathing becomes gasping and difficult, or is altogether suspended; the heart beats violently; the vessels of the head become turgid and the face is livid; foam, often bloody, issues from the mouth; the jaws are contracted with great force, so that the under lip, or the tongue if protruded, is apt to be severely injured. The fæces, urine, and semen are sometimes expelled, and priapism is not uncommon. After the convulsions have continued for a few minutes, they cease, leaving the patient motionless, but in a state of insensibility, and under the appearance of a profound sleep. He gradually recovers, and, if left to himself, will generally sleep for some hours. Sometimes there is a succession of fits, with intervals of torpor, lasting for several hours.

There is a form of epilepsy, of frequent occurrence, called by the French *petit mal*, in contradistinction to the foregoing, which is designated the *grand mal*. It consists in sudden and transient giddiness with loss of consciousness, confusion or incoherence of mind, and unsteadiness of gait, accompanied in some instances by erections of the penis, in others by slight convulsions. Such slight fits are often followed by great confusion of intellect, and sometimes by maniacal incoherence. (In one case of epilepsy belonging to this class every fit of epilepsy was followed by an unconscious exposure of the person.—G.)

Premonitory symptoms.—In some cases the fit is ushered in by premonitory symptoms, such as pain in the head; lassitude; bright circles of colours before the eyes, sudden flashes of light, in rare instances spectral illusions; or there is a loud noise in the ears; or an offensive smell; or a bitter taste; unquiet sleep; unusual dread; palpitation of the heart; coldness of the joints; fluttering at the epigastrium; vomiting; a sensation of cold, or a pain arising in some part of the extremities, and gradually creeping upwards till it reaches the head (the *aura epileptica*), when the patient is instantly deprived of sense, and falls as above described. (In a case that came under my notice, every fit was preceded by the utterance of the same incoherent sentence, to which the patient attached no meaning.—G.) But in the majority of cases, the fits are not preceded by any warning. They occur at very variable intervals; sometimes in the day, sometimes at night, during sleep; and there are often several fits in the twenty-four hours; in other cases, there are intervals of months or years.

CAUSES.—*Predisposing.* Epilepsy or insanity in parents or ancestors; scrofula; malformation of the head; the male sex; debility in nervous persons; dissipation, intemperance, self-abuse, and excessive or suppressed discharges.—*Exciting.* Sudden fright; fits of passion, or vehement emotions of the mind; sexual intercourse; masturbation; plethora of the vessels of the head; anæmia of the brain and spinal cord, such as occurs in cases of excessive uterine hæmorrhage (epileptic convulsions terminate the lives of animals who are bled to death); reflex irritation from worms; dentition; acute pain; excessive evacuations; suppression of accustomed discharges, especially the urine and the bile; tumours compressing the brain, or any part of the nervous system; parasites in the brain (the cænurus cerebralis is the common cause of convulsions in sheep). Epilepsy sometimes occurs as a symptom of poisoning, especially in poisoning by arsenic and lead.

MORBID ANATOMY.—In most cases there is congestion of the vessels of the brain. In the remainder, such causes of irritation as thickening of the membranes, spiculæ of bone, internal nodes, tumours, or the cystic form of tænia.

DIAGNOSIS.—From *hysteria*, by the total suspension of consciousness, the solitary cry, and the deep sleep which succeeds the fit. From *feigned* epilepsy, by the total insensibility, extending even to the retina. From *apoplexy*, by the transient nature of the fit, the absence of the stertorous breathing, and, in most cases, by the absence of paralysis, and the completeness and universality of the convulsions. From *tetanus*, by the insensibility, and the clonic character of the convulsion.

PROGNOSIS.—*Favourable.* When sympathetic, occurring before the age of puberty, and arising from exciting causes easy of removal; or originating in functional derangement of the uterine system.—*Unfavourable.* When the disease comes on after puberty; hereditary predisposition; scrofulous diathesis; long previous continuance of the malady, and frequent occurrence of the fits; misshapen skull; the epileptic physiognomy; impairment of memory and judgment.

TREATMENT.—I. During the fit. II. During the interval.

During the fit.—The patient should be placed, if possible, on a soft bed, the neckcloth and shirt-collar loosened, and the tongue protected by a piece of soft wood, or a pad of linen, placed between the teeth. When the fits occur during sleep, and the tongue is severely bitten or torn, the patient should wear a smooth rounded guard, fitting closely to the teeth, above and below. After the fit, the patient should be allowed to sleep; if much exhausted, he may take some slight stimulant.

In the interval.—The recurrence of the fit is sometimes prevented—

1. By removing all causes of irritation, as constipation, intestinal worms, the irritation of teething, &c.

2. By avoiding the exciting causes, such as over-distension of the vessels of the head, however induced; fits of passion, or other violent emotions of the mind; intemperance, dissipation, or other bad habits.

3. If the patient be plethoric, by occasional bleeding, abstemious diet, and saline aperients. Issues or setons in the neck or arm, or antimonial ointment rubbed into the spine, sometimes give relief.

4. If the patient be weak and irritable, by tonics; as quinine, sulphate, oxide, and valerianate of zinc, sulphate and sesquioxide of iron, sulphate or ammonio-sulphate of copper, nitrate of silver (an objection-

able remedy, because it sometimes causes permanent discoloration of the skin), and liq. arsenicalis. He should rise early, take regular exercise, nourishing but not stimulating diet, and use cold bathing, or the shower-bath.

In females attention should be paid to the state of the uterine function. Amenorrhœa; amenorrhœa with plethora; dysmenorrhœa; leucorrhœa or menorrhagia; the nervous symptoms attendant on these conditions, and on the change of life, should receive early attention, according to the rules given for the treatment of these diseases.

5. Bromide of potassium has been much used of late years, and, according to some observers, with marked success. Beginning with 5 or 10 grains, the dose may be increased to 30 or 40 grains.

6. If there be a syphilitic taint, mercury, or iodide of potassium.

Remedies.—*Immediately before the fit.* Pressure on the carotids; a ligature between the parts from which the *aura* first proceeds and the brain, as round the thumb or little finger when it begins there; a strong mental effort; violent exercise; irritation of the nostrils, with snuff, or strong smelling-salts; dashing cold water over the face and head; an emetic; a full dose of opium or laudanum.—*In the intervals.* Wormwood; gratiola; mugwort; *narcotics and sedatives*, as opium, lactuca, conium, stramonium, belladonna, and digitalis; *antispasmodics*, as valerian, assafœtida, musk, and castor; turpentine, indicated wherever worms are suspected to exist. Nux vomica and strychnia; electric sparks drawn from the head. In cases preceded by the aura, division of the nerve running from the seat of the aura or amputation of the part, have been recommended, but they are of very doubtful efficacy.

CATALEPSIA—CATALEPSY.

Definition.—A sudden loss of consciousness with retention of the posture in which the patient happens to be at the moment of seizure.

Symptoms.—Catalepsy is an extremely rare disease, allied to those of the present section. Its essential features are, a fixing of the body in the position in which it happens to be in at the moment of the seizure, or in which it may be placed during the fit, accompanied by total insensibility. The fit itself is rarely, if ever, fatal; but the intellectual faculties seem to suffer by its frequent repetition.

A lad of about fourteen years of age, a playmate of my own, was subject from childhood to this disease. He was often seized in the midst of his sports, without previous warning, and fixed like a statue in the attitude in which he happened to be at the moment. The fit rarely lasted more than one or two minutes, and when it ceased, he resumed his play with a slight air of surprise and embarrassment. He was found dead in a bath, into which he had fallen. (G.)

The *causes* of this disease are obscure, and little is known of its appropriate treatment. The general principles on which it should be conducted are the same as those of epilepsy. Existing irritation must be removed, and any occasional determination of blood to the head must be removed by appropriate remedies.

CHOREA SANCTI VITI—ST. VITUS'S DANCE.

DEFINITION.—Functional derangement of the motor nerves resulting in irregular jerking movements, interfering more or less with the voluntary action.

SYMPTOMS.—The disease generally sets in with slight convulsive movements of the face or of one of the legs, which gradually extend and increase in severity until they embrace one side of the body, or the whole frame. When the disease is fully formed, the patient is in almost constant motion; the head is jerked to one or other side; if standing, the foot shuffles and scrapes the floor. The walk is hurried and uncertain; sometimes the affected leg is not lifted but dragged along, as if the whole limb were paralytic; and when an attempt is made to lift it, the limb becomes irregularly and ludicrously agitated. Even when the extremity is at rest, the foot is often turned alternately outwards and inwards. The arm of the same side is similarly affected, so that in trying to raise anything to the mouth, the patient often jerks it over the head, and succeeds only after repeated attempts, and swallowing is performed hastily and with ludicrous grimaces. If the patient be told to hold the arm extended, he cannot keep the fingers steady, but the arm is soon withdrawn, the movement being generally accompanied or followed by a grimace. The muscles are usually quiet during sleep; but there are exceptions to this rule. The health is generally only slightly impaired; but constipation is an almost constant symptom, and there is sometimes loss of appetite, a foul tongue, and offensive breath. In females, the uterine functions are sometimes disordered. Incoherence is an occasional accompaniment. A bellows murmur is often heard over the heart.

The disease affects weakly boys and girls, but rarely attacks adults, and when it does so, the choreic movements are limited. The following is a good illustration:—A maiden lady, aged 60, had been affected for two years with convulsive movements of the muscles on the right side of the neck, twisting her face during her waking hours towards her right shoulder. While in this position it was jerked fifty times a minute still further backwards. Sometimes the head was jerked suddenly backwards. When walking she was impelled to go fast, and sometimes stumbled. There was no evidence of cerebral or spinal disease; the health was otherwise good, and she took regular exercise. When her attention was fixed upon some object the movements decreased. During sleep and when the attention was fixed, as in reading, the convulsive movements ceased. The affection commenced by a screwing of the right side of the face into the pillow when she lay down at night. It was removed by the internal administration of sulphate of copper and the use of the sponge bath.

Causes.—*Predisposing.* General weakness and irritability of the nervous system; youth (from 7 to 15 years); female sex. It may occur in adults of both sexes to the age of seventy.—*Exciting.* Intestinal irritation from constipation or worms; uterine irritation; strong mental excitement, as from fright or anger; blows or falls; irritation of the spinal cord or its membranes. In many cases rheumatism has preceded the disease, or is still associated with it, and is therefore considered by some physicians to be a cause of chorea as well as of the cardiac disease which frequently accompanies it.

Prognosis.—Favourable in the great majority of cases.

Treatment.—*Indications.* I. To remove causes of irritation. II. To improve the general health.

I. By far the most common cause of irritation is in the bowels, and purgatives, judiciously and perseveringly administered, are the chief remedies; in most cases, perhaps, the only efficient ones. A dessert or table-spoonful of castor-oil, or other simple aperient, may be given every other morning. More active purgatives may be used if necessary. The bowels should be kept open once or twice daily, but hypercatharsis should be carefully avoided. The evacuations should be inspected daily; and the purgative plan persevered in till the discharges assume a healthy appearance. In many cases, nothing more will be required.

Hemlock is a valuable remedy when the disease arises from centric irritation. From ʒiss to ʒiv, or more, of the succus conii, may be given once, twice, or thrice a day.*

If the source of irritation be in the uterus, remedies appropriate to the disorder of that organ must be given. If there be tenderness of the spine, the case should be treated as one of spinal irritation.

II. The general health may be improved by tonics, of which the sulphate and valerianate of zinc, the ammonio-sulphate of copper, and the sulphate or peroxide of iron, in full doses, are the best, aided by cold affusion or the shower-bath, with nourishing diet, fresh air, and regular exercise. (One of the worst cases of chorea that I have seen, and one which combined constant restlessness and grotesque actions of the muscles with mental incoherence, was cured within ten days by aperient medicines only.—G.)

HYSTERIA—HYSTERICS.

Definition.—A nervous disorder, usually attended with marked disturbance of the functions of digestion and respiration, and characterised by convulsive fits in which those functions are signally affected, and the controlling power of the will strangely impaired, without complete loss of consciousness.

Symptoms.—The hysteric paroxysm, or fit, is generally preceded by an uneasy sense of fulness and weight at the pit of the stomach, with nausea, acidity, heartburn, and flatulence ; followed by sighing, yawning, and stretching, dejection of spirits, shedding of tears, alternate chills and flushings, difficulty of breathing, and palpitation. There is often a sharp pain in the left side, about the flexure of the colon, with the sensation of a ball or globe rolling about, and a peculiar gurgling and rumbling sound, known as *Borborygma* (*globus hystericus*), and gradually rising into the stomach, and hence to the throat. The fit having arrived at its height, the patient appears threatened with suffocation ; the face is flushed, the nostrils are distended, the abdomen is protruded and tympanitic, the head is thrown forcibly back, and the limbs are strongly convulsed. The patient bursts into violent fits of laughter, sobbing, or screaming, utters incoherent expressions, and is in a state of temporary delirium ; from which, however, she is readily roused so as to answer questions rationally. The spasms at length abate, a quantity of flatus is noisily expelled by the mouth, and there is an abundant flow of limpid urine ; and the patient recovers, recollecting imperfectly what has taken place. The fit is often followed by a severe pain in the head, and a sensation of soreness over the whole body.

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* "On the physiological action and therapeutical use of Conium, &c.," by the Editor.

Sometimes the hysteric fit consists in a sudden apparent loss of speech, sense, and motion, with a distinct recollection of what has been said and done. Sometimes, again, it is characterised by a sudden access of laborious breathing, swollen neck, flushed cheeks, and a closed and trembling eyelid ; and the patient recovers, crying and sobbing.

CAUSES. — *Predisposing*. Female sex ; celibacy ; the age from puberty to the fifty-fifth year ; studious and sedentary life ; grief ; anxiety ; delicate health ; plethora ; the scrofulous diathesis. It is rare in the male sex, but may occur, under mingled debility and mental excitement.—*Exciting*. Constipation ; dyspepsia ; flatulence ; excessive evacuations ; suppression of the menses or lochia ; the plethoric and anæmic states ; violent emotions ; imitation or sympathy ; tight lacing, or other impediments to the breathing. Spinal irritation.

DIAGNOSIS.—From *epilepsy*, by the retention of consciousness, and of some voluntary control over the convulsive movements ; by the marked affection of the respiratory muscles, as shown in sighing, sobbing, and yawning, cries, shrieks, and laughter ; by the absence of any great distortion of the features ; and by the peculiar trembling of the eyelid. (This latter sign is of great value, for whenever it is present, whether in men or women, whatever the name given to the disorder, whether hysteria, catalepsy, trance, or mesmeric slumber, it is a sign of safety, and strongly suggestive of cold affusion.—G.) From *mimosis inquieta*, by the marked character of the hysteric fit ; but true hysteric fits may be superadded to the group of symptoms which bears that name.

PROGNOSIS.—*Favourable*. In males affected with hysteria there is some ground to apprehend future mental unsoundness.

TREATMENT.—I. During the fit. II. During the intermissions.

During the fit.—In general nothing more is necessary than to dash cold water repeatedly into the face; to restrain the patient with a loud and decided tone. The stays should be loosened, and ammonia applied to the nostrils. Assafœtida, æther, valerian, castor, opium, &c., are of little use.

The persevering use of cold water as a shock, not only serves to remove the existing attack, but often effects a cure after antispasmodics have been used in vain. In a young man who had had repeated attacks of hysteria in a marked form, and had taken the strongest and most nauseous remedies for several weeks without effect, this simple means speedily effected a cure. I have seen a prompt and a permanent cure follow the disuse of tight lacing. (G.)

During the intermissions.—The bowels must be kept free by gentle aperients; and the dyspeptic symptoms removed by appropriate remedies. If there be debility, stimulants or tonics, of which the metallic are the best, will be required; if plethora be present, a restricted diet. Anæmia, spinal tenderness, mimosa inquieta, and disorders of the uterine function, require the remedies proper to these disorders. Change of scene, cheerful society, regular exercise, and the shower-bath may be prescribed with advantage.

Hysteria is common in perverse and irritable females, and in persons of both sexes possessed of little self-control. The education of young girls of the present day, combining, as it does, excessive mental, with strongly defective physical exercise, predisposes to hysteria.

Hysteria is rare in strong-minded females: and of three cases which have come under my notice in the other sex, two occurred in men remarkable for their want of self-control, one of whom became insane; and the third was a single attack occurring in a medical student, on obtaining a prize for which he had long been anxiously striving. (G.)

In the foregoing description, the term hysteria has been restricted to a disorder accompanied by fits, but it is usual to give to this term a much more extended meaning, and to designate as hysterical all the more obscure diseases of females. This indiscriminate usage of the term often leads to unsatisfactory views of the real condition with which we have to do. There are affections, however, which may, without impropriety, be designated as hysterical; such as aphonia, dysphagia, dry noisy cough, dyspnœa, hiccup, flatulence, paralysis, syncope, brow ague, irritable breast, besides a large class of anomalous nervous affections, which often closely simulates diseases of a more formidable character. The mind of hysterical females is often in a state bordering on insanity; an intense desire for sympathy being the mainspring which sets the strange machinery in motion. The mind, in fact, is in the same state as the body; and as the convulsive movements are partly due to an excited state of the reflex function, and partly to an absence of self-control, so the extraordinary mental condition is the effect of the extension to the brain of the same condition of the nerves accompanied by the same absence of self-control.

We shall often be greatly assisted in determining the true nature of these anomalous diseases by observing one or other of the following circumstances:—1. That the patient, seeming to labour under a disease which is usually accompanied by emaciation and a decided appearance of ill-health, loses neither flesh nor colour; so that if she has long been confined to bed with paralysis, her limbs remain plump and firm; if she has not been able to swallow for weeks, or is troubled with incessant vomiting, she seems to have taken at least three meals a day; if she has been a martyr to excruciating pain, her face is as free from wrinkles as if she had never had a care or a pang.—2. That though, in some anomalous cases, the patient seems to be altogether insensible, the pulse beats as usual, the face has its natural colour, and while all other parts are motionless, the eyelids vibrate rapidly, and especially when any effort is made to rouse her.—3. That a great portion of these affections are associated more or less with disorders of the respiratory function. —4. That the patient is, or has been, subject to flatulence, borborygma, globus hystericus, or well-marked hysterical fits. In the treatment of these disorders, the medical man must combine great firmness with kindness, and not spare cold water. Cold affusion is the only remedy which can be relied on, and is worth a whole pharmacopœia of antispasmodics. (G.)

TETANUS, OR TRISMUS—LOCKED JAW.

Varieties.—1. Traumatic Tetanus. 2. Idiopathic Tetanus (including Tetanus neonatorum).

Symptoms.—In most cases the onset of the disease is obscure. Traumatic tetanus is generally preceded by pain at the seat of the injury. In both forms, the first symptom is usually a sense of stiffness in the nape of the neck, rendering the motion of the head difficult and painful. This is soon followed by a sense of tightness and stiffness in the lower jaw, with difficulty in swallowing. The patient also complains of pain, often violent, referred to the sternum, and thence shooting to the back. This is followed, after a variable interval, by increased rigidity of the lower jaw, and by spasms of the muscles of the neck, pulling the head strongly backwards. The teeth at length become closely and firmly set, when the affection is called *trismus*, or *locked jaw*; and the features gradually stiffen into a ghastly fixed smile (*risus sardonicus*).

As the disease advances, the muscles of the trunk and spine become involved, so that the whole body is bent forcibly backwards (*opisthotonos*), or forwards (*emprosthotonos*), or to the side (*pleurosthotonos*).

At length the disease extends to every organ of voluntary motion; the limbs are rigidly extended; the abdominal muscles strongly contracted; the eyes fixed; the forehead furrowed; the jaws strongly closed, and the angles of the mouth powerfully retracted and wrinkled, giving to the face the expression of a sardonic grin. These violent contractions occasion the most excruciating pain. The pulse is accelerated, the respiration suspended or laborious, the heat of the surface greatly increased, and the skin covered with a profuse perspiration. A partial remission of the symptoms occasionally takes place every ten or fifteen minutes, but they are renewed, with aggravated torture, from the slightest causes, even the least motion of the patient, or the touch of an attendant. If the patient fall asleep, the muscles relax.

In fatal cases, the symptoms rapidly increase in severity; there is urgent dyspnœa, with an agonising sense of suffocation; a cold clammy sweat; a small and imperceptible pulse; froth or bloody mucus at the mouth; the countenance becomes livid; delirium sometimes supervenes, and the patient dies exhausted, or suffocated by the rigid spasm of the muscles of respiration. The mind, in most cases, remains intact to the last.

The *duration* of the disease varies. One case of acute tetanus is on record which proved fatal in a quarter of an hour; the common duration of fatal cases is from four to eight days. In cases of recovery, the duration varies from a week to two or three months.

LATENT PERIOD. — From a few minutes to ten weeks. Most common period, from the fourth to the fourteenth day.

CAUSES.—*Predisposing.* The male sex; robust and vigorous constitution; warm climates; the period of infancy.—*Exciting.* Vicissitudes of temperature; exposure to cold and damp, or to excessive heat; great fatigue; wounds, especially punctured wounds of the extremities; injuries of nerves or tendons by puncture or laceration; the presence of irritating substances in the stomach or alimentary canal (the common cause of the *tetanus neonatorum*); irritation of the extremities of the nerves; affections of the mind; strychnia and other vegetable poisons.

MORBID ANATOMY.—Not constant. In some cases increased vascularity of the spinal cord and its membranes; but in many instances those parts are perfectly healthy, the disease being due to some remote irritation conveyed to the spinal marrow, and reflected on the muscles. Traces of injury to the nerves in cases of traumatic tetanus. The muscles often ruptured and gorged with blood.

DIAGNOSIS.—From the *effects of strychnia* by the obscure character of the first symptoms, their slow development, and local character (the stiffness of the jaws and difficulty of swallowing preceding, often by a considerable interval, the affection of the muscles of the trunk and extremities); also by the interval of several hours or days which elapses in tetanus before the patient dies or recovers; to this rule there are a few exceptions in cases of injury to the spine. Strychnine, on the other hand, proves fatal in from a quarter of an hour or less to within three hours. From *tetanic* spasms following the action of other poisons by the coincidence in such cases of other symptoms characteristic of the action of those poisons.

PROGNOSIS.—Extremely unfavourable; more so when the disease arises from wounds or injury to the nerves than when proceeding from cold; when it comes on suddenly, and soon after the receipt of an injury, and rapidly increases in severity, than when slow in its progress; when the spasmodic contractions quickly succeed each other, and are excited by very slight causes, than when there is a considerable interval. Survival beyond the fourth day is a favourable circumstance.

Treatment.—Must be directed to the relief of the excitement of the motor function of the cord by means of conium, tobacco (Enema tabaci), or the Calabar bean ($\frac{1}{16}$ to $\frac{1}{4}$ grain of the extract), remedies which act directly in repressing convulsive action. Of these conium is the most appropriate. If the patient can swallow, ʒiv–ʒviii of the succus conii may be given at intervals of a few hours. When the medicine cannot be given by the mouth, it may be injected into the rectum. Alcohol may be given with the same view, until intoxicating effects are produced.

The *counter-irritant* plan consists in the application of blisters along the whole length of the spine, and in the use of electricity. When a continuous current of electricity is passed along a nerve its excitability is diminished; and M. Remack thought that he could prove in man that these currents possessed the property of causing involuntary contractions to cease by preserving to the muscles the faculty of obeying the will. Nobili and Matteucci have succeeded in relaxing muscles affected with tetanic spasm by passing a current through them, the direction of which was the reverse of that which naturally circulates in the nerves. We may, therefore, hope to control the excessive electrical excitement of the spinal cord by passing through it a continuous current, from a voltaic pile or trough, taking care that the conductor in connection with the zinc plates be placed at the top of the spine and the other lower down, or upon the surface of the limbs in succession. In order to bring the cord within the more immediate influence of the current, a stout needle or two in connection with the conductor may be passed through the integument and muscles covering the spine. If the mouth continue firmly closed, food and medicines must be given by means of a flexible tube passed through the nostrils, or behind the last molar tooth, or by enemata. During the fits, the patient may be brought under the influence of chloroform.

If there be any tenderness of the spine, a blister or a bladder of ice may be applied to the whole length of it.

The rest of the treatment will consist in giving wine and nourishment at short intervals, and keeping the patient as quiet as possible.

TETANUS NEONATORUM—INFANTILE TETANUS.

Synonym.—Trismus nascentium.

Symptoms.—In the second or third week after birth, tetanic spasm, beginning in the muscles of the jaw, and thence, in some cases, extending to the whole body, and proving rapidly fatal.

Causes.—Improper diet, as in the Westmann Islands off the coast of Greenland, where the food of children consists almost exclusively of fish; intestinal irritation in hot climates; the impure air of crowded foundling and lying-in hospitals. Intense cold.

TREATMENT.—An aperient at once, followed by a warm bath. The diet should be restricted either to the mother's milk, or to that of the cow. A drachm of castor-oil is a convenient aperient. Free ventilation is an essential part of the treatment.

HYDROPHOBIA—CANINE MADNESS.

DEFINITION.—Intense excitability of the nervous system, with irritation of the fauces acting on the spinal cord through the incident nerves, and giving rise to reflex spasm of the muscles of deglutition.

SYMPTOMS.—At an uncertain interval after the bite of a rabid animal, pain, stiffness, or some unusual sensation, often accompanied by inflammation, is felt in the seat of the wound, followed, in many cases, by pains darting thence along the course of the nerves. These local symptoms are not always present. After a few hours or days, wandering pains are felt in different parts of the body, with stiffness of the neck and throat, restlessness, irritability, and drowsiness; the spirits are depressed; there is frequent and deep sighing, and the sleep is disturbed with frightful dreams.

The true nature of the case is first revealed by an unusual difficulty in swallowing liquids, which increases till it becomes intolerable; and the moment any fluid is brought near the patient, or when the motion of the fluid is heard, he starts with horror, and the attempt to swallow is hurried, accompanied with sobbing or deep-catching-sighs, and followed by convulsions.

There is intense irritability; the countenance expresses great anxiety, alarm, and suspicion; the eyebrows are contracted, the eyes wild, staring, and glassy; there is intolerance of light and sound, urgent thirst, a parched tongue, a hot and dry skin, and retching. The sufferer often screams violently, talks in a loud, authoritative tone, and spits out the viscid saliva between his closed teeth, with loud and noisy strainings, not unlike the barking of a dog. In spite of these severe sufferings, the mind often remains unaffected to the last, but in other cases the patient lapses into wild delirium, talks incessantly and incoherently, and is in a state of the most distressing restlessness; the slightest motion, or sudden change of position, a breath of air, a ray of light, a polished surface, or the least noise, will excite a sensation of suffocation or convulsions; delirium in some instances takes place, convulsions now become frequent, and the patient dies convulsed, exhausted, or asphyxiated.

DURATION.—Generally from two to three days. In one case, thirty-six hours; in rare instances, eight or nine days.

LATENT PERIOD.—From three or four weeks to some months, or even years: most common period from twenty to forty days.

DIAGNOSIS.—The disease cannot be confounded with any other. The cause and symptoms are alike peculiar and characteristic.

PROGNOSIS.—Fatal. The disease has hitherto defied all remedies.

MORBID ANATOMY.—Not constant. Slight traces of inflammation in the spinal marrow and its membranes. Inflammation of the fauces and air-passages, with increased secretion.

TREATMENT.—*Indications.* I. To prevent the absorption of the poison. II. To remove the irritation of the throat. III. To diminish the excitability of the nervous system.

I. Persevering suction of the wound should be used without a moment's delay; this should be promptly followed by excision of the part, and the subsequent application of a poultice. If this cannot be done at once, and the wound is on the arm or leg, a ligature should be applied above the wound. This treatment is to be preferred to the use of caustic.

II. The second indication is best fulfilled by constantly swallowing ice.

III. The third indication may be fulfilled by powerful doses of conium alone, or in combination with opium. Chloroform is a very useful palliative.

Ice was swallowed with great advantage in a remarkable case admitted to King's College Hospital under the late Dr. Todd. The patient, a boy seven years of age, labouring under hydrophobia in its most marked form, and refusing, with characteristic horror and impatience, everything previously offered him, whether in a liquid or solid form, and who had taken ten drops of dilute hydrocyanic acid, repeated at short intervals, and at length twenty drops in one dose, without apparent effect—after the most severe convulsive paroxysms which had yet seized him, was offered a fragment of rough ice. This he swallowed with avidity. Fresh pieces were swallowed with the greatest ease. In less than half an hour, he had taken about a pound and a half of ice. At the same time that it was given internally, a bladder containing a mixture of broken ice and common salt was applied to the whole length of the spine and around the throat. Under the external and internal application of cold, all the symptoms of hydrophobia, referable to the throat and chest, with the exception of occasional hawkings, had passed away; the viscid mucus no longer flowed from the mouth, the mucous râle disappeared from the chest, and nothing remained but extreme restlessness, violent excitement, and incoherence. The patient sat up in bed with a large fragment of rough ice in each hand, talking incessantly and incoherently in a loud voice, and showing an aimless eagerness. The intense excitement continuing, and all the peculiar symptoms of hydrophobia having subsided, the cold *douche* was, in Dr. Todd's absence, applied by my directions, but the system did not rally from the shock. (See Lancet, January 22, 1842.)

I am inclined to attribute more benefit to the internal than to the external use of ice in this case, but the joint administration, while the rest of the body is kept warm, seems to be the most rational treatment yet recommended. (G.)

DISORDERS OF THE MIND.

Mania	Furious Madness.
Melancholia	Melancholy Madness.
Hypochondriasis . . .	Vapours—Low Spirits.
Delirium Tremens . .	Drunkard's Delirium.

MANIA—FURIOUS MADNESS.

Symptoms.—This disease sometimes comes on suddenly, but more frequently slowly and almost imperceptibly. For some months or even years, the thoughts, habits, tastes, temper, and affections of the patient gradually become more and more the reverse of his former self. He suffers from a distressing confusion of ideas, a failure of memory, depression of spirits, a loss of interest in his ordinary pursuits, with extreme irritability of temper, restlessness, and wakefulness; and he has a miserable consciousness of loss of mental power and change of character. The general health suffers; there is pain in the head, and giddiness; the appetite fails, the sleep is disturbed, the bowels are confined, or irregular, or affected with diarrhœa; the tongue is furred; the pulse frequent and quick; the patient grows thin, and the features alter. Frequently before the disease shows itself in its marked form, the bodily health improves, and the painful consciousness of unsoundness disappears.

After these symptoms have lasted for a variable period, without attracting much attention, some accident, injury to the head, mental shock, or unusual excitement of the mind, or some more trivial circumstance, brings on decided mania.

The symptoms of mania, whether they set in suddenly or come on gradually, are the following:—anxiety, uneasiness, restlessness, sleeplessness, alternate excitement and depression, or continued agitation and violent muscular efforts, rapid and incoherent discourse, fits of loud laughter or shoutings, grinding of the teeth, spectral illusions, mental delusions, and unfounded antipathy to certain persons, particularly to near relations or intimate friends. There is a peculiar wildness and fierceness of countenance, the pupil is dilated, the eyelids widely open, the eyes glistening and unsteady, the features strongly marked, and the countenance flushed. The patient will sometimes complain of severe pains in the head, giddiness, loud noises in the ears, and bright spots before the eyes. The sensations are generally more obtuse than usual, or they are disregarded, so that the patient will bear the most intense cold or heat, prolonged abstinence from food or drink, and long-continued want of sleep. The bowels are usually costive, and require strong aperients; the taste is often depraved, and the appetite variable; the tongue is dry and furred; the pulse accelerated and often full; the habits are careless and negligent, and often filthy. The disease is sometimes complicated with epileptic fits, with symptoms of paralysis, or with disease of the brain.

Some maniacs have lucid intervals, which occur with regularity;

others are subject to paroxysms of very irregular occurrence. They are also capable, under certain circumstances, of considerable self-restraint, and of concealing their delusions or designs, and they will carry out their plans with the perfect cunning and contrivance of sane men.

Attacks of mania sometimes seem to suspend other diseases, such as gout and consumption: they may also be attended by a remarkable improvement in the general health; and they are consistent with the attainment of a good old age. Relapses are common. Mania often supervenes on less acute disorders of the mind, and it generally passes into dementia, which is often complicated with paralysis.

MORBID ANATOMY.—Atrophy of the brain; thickening and opacity of the arachnoid; effusion of serum beneath the membranes or in the ventricles; increased or diminished vascularity of the substances of the brain; softening of the grey matter, especially in cases accompanied by paralysis; increased density of the whole brain, or of parts of it. But there is no morbid appearance proper to insanity.

CAUSES.—*Predisposing.* Hereditary tendency; the adult age (I have never seen it earlier than the sixteenth year—Heberden).—*Exciting.* Violent emotions; intense application to study or business; immoderate indulgence of the passions; violent exercise; frequent intoxication; parturition, lactation, and change of life; blows on the head. Certain diseases of the brain, preceding attacks of epilepsy, and acute febrile disorders.

DIAGNOSIS.—From *encephalitis*, by the absence of febrile symptoms. From *delirium tremens*, by the more violent excitement, the more complete incoherence, the absence of tremor, and the history of the case.

PROGNOSIS.—*Favourable.* Following some other disease, or arising from some temporary cause, such as an occasional excitement of the mind or a single debauch; the attacks being slight and infrequent; youth; hæmorrhage; diarrhœa.—*Unfavourable.* Coming on after the middle period of life, or having been of long continuance; complication with epilepsy or paralysis.

TREATMENT.—In the early stage the *medical* treatment must be determined entirely by the condition of the bodily functions. Symptoms of determination of blood to the head, must be met by remedies suitable to that state. Constipation will require the use of aperients. When the secretions are disordered, the patient must be put under a course of alteratives; suppressed discharges must if possible be restored. If there be anæmia, or debility arising from other causes, tonic remedies are indicated, and if the habits of the patient be in any respect unfavourable to health, a change must be insisted on. The habitual use of the shower-bath, change of air, a nutritious and unstimulating diet, regular hours for meals and rest, and an abstinence from business, with change of scene, and cheerful society, should be particularly enforced. The *moral* treatment will consist in removing as much as possible all causes of excitement, all unnecessary opposition to the patient's plans and wishes, with great forbearance on the part of relations and attendants.

When the disease is fully developed.—If there be decided symptoms of determination of blood to the head, bleeding, cupping, leeching, cold to the head, brisk purgatives, and low diet must be prescribed. When the patient is extremely violent and sleepless, opium may be given with advantage in large doses. We may begin with five grains, and increase the dose till it reaches ten, fifteen, or even twenty grains; and as much as half a drachm may be given in the course of the day, and continued for days, or even weeks. This treatment seems to be peculiarly applicable to cases brought on by exhaustion, whether from loss of blood, starvation, intemperance, or dissipation, and in puerperal mania. If the face be pale, or the attack of mania have been preceded by loss of blood, debilitating discharges, or exhausting diseases, tonics or stimulants, according to the degree of the debility, in combination with opiates, must be resorted to. In all cases allied to hysteria, the shock of the cold affusion, or the shower-bath, is highly advantageous.

The moral treatment.—In recent cases it is necessary to prevent the patient from offering violence to himself or others by the strait waistcoat, or the coercion of powerful attendants. The fury of madmen and the viciousness of brutes can be tamed by similar means. While treating him kindly, the attendant must make the patient feel that he is both wiser and stronger. In chronic cases, and in lunatic asylums, personal restraint can often be foregone, and constant watchfulness, gentle and conciliating treatment, and occasional seclusion, may be substituted. Much depends upon gaining the confidence of the maniac, and keeping out of sight all irritating means of restraint.

The patient should be engaged in some exercise or pursuit that will employ at once the body and the mind, and thus divert the latter from one invariable train of thought. He should, therefore, be removed from those objects with which he was formerly acquainted, and out of reach of things and persons associated with the origin of his disease. When there is a tendency to suicide, the most constant vigilance is required.

Mania is only one of many mental disorders, but it is the one which the practitioner is most likely to be called upon to treat. The other forms of mental unsoundness, not treated of in the present chapter (viz., idiocy, imbecility, and dementia), rarely require more than moral treatment.

For a more minute account of many of the phenomena of unsound mind, see Part I. p. 116.

MELANCHOLIA—MELANCHOLY MADNESS.

SYMPTOMS.—This disease is characterised by dejection of spirits, seclusion, timidity, fickleness, and great watchfulness, and is generally accompanied by disorders of the digestive organs, with flatulence and costiveness. The mind pursues one object or train of thought, which usually bears a near relation to the patient himself, or to his affairs, which he views with great and unfounded apprehension, and extreme depression. This painful state of mind is often attended by a strong propensity to suicide. In one form of the disease the patient refers some bodily sensation to imaginary and impossible causes, as living animals, or even persons, in the stomach or bowels.

CAUSES.—*Predisposing.* Hereditary tendency to insanity.—*Exciting.* Chronic disease of the liver and organs of digestion; suppressed evacuations; distress of mind; sudden mental shocks; anxiety; excessive evacuations; intemperance.

DIAGNOSIS.—From mere depression of spirits by its exaggerated and persistent character, and the existence of delusions. The term melancholia is sometimes improperly used for monomania.

PROGNOSIS.—*Favourable.* The absence of hereditary tendency; the previous short duration of the disease; the reappearance of habitual evacuations; sound sleep.—*Unfavourable.* Hereditary predisposition; the chronic character of the disease, or its association with epilepsy.

TREATMENT.—The *medical* treatment consists in regulating the functions of the stomach and bowels by aperients and alteratives, and in the use of remedies adapted to the state of the patient's constitution. The shower-bath may be prescribed with advantage.

The *moral* treatment consists in changing the scene, amusing the mind, and diverting the attention as much as possible from the existing train of thought; travelling, rural sports, society, conversation on favourite topics, and music, may be recommended, according to the tastes of the patient, his previous habits of life, and the experience of his friends or attendants. Patients who betray the slightest tendency to suicide must be closely and constantly watched. When the patient supposes the stomach or bowels to be the seat of some living animal, a pretended operation for its extraction will often effect a cure.

HYPOCHONDRIASIS—VAPOURS—LOW SPIRITS.

SYMPTOMS.—Dyspepsia, with dull pain in the hypochondria; languor, listlessness, want of resolution and activity, disposition to seriousness, sadness, and timidity as to future events. The patient pays particular attention to his health, exaggerates his symptoms, and takes very desponding views of his case.

CAUSES.—*Predisposing.* The melancholic temperament.—*Exciting.* Dyspepsia; painful impressions upon the mind; distressing events.

DIAGNOSIS.—From *melancholia*, by the more constant dyspeptic symptoms, and the absence of well-marked delusions. From *dyspepsia*, by the exaggerated importance attached to existing symptoms.

TREATMENT.—That proper to dyspepsia. Change of air and scene, where they can conveniently be had, should be prescribed; and the patient should be diverted, as much as possible, from the thought of his complaints. Care should be taken not to increase the disease by prescribing active remedies.

DELIRIUM TREMENS—DRUNKARD'S DELIRIUM.

SYNONYM.—Mania à potu.

While drunkenness is the commonest cause of this condition, we must be alert to recognise the other causes (see below).

SYMPTOMS.—Sleeplessness; restlessness; excitability; strange illusions of the senses of sight and hearing; and delirium, during which the patient recognises those about him, answers questions rationally, and does hurriedly what he is told to do. He talks incessantly, and evinces a great anxiety to be doing something; and will often be found busily looking, in unlikely places, after some object on which his mind is intent; or he will transact his ordinary business in a dreamy and strange way. He is timid and suspicious, and fancies that he is surrounded with enemies, or that he is in a strange place, from which he is constantly endeavouring to escape; or he thinks that some great evil is impending, or has actually befallen him. His attention is constantly diverted by illusions of various kinds. He is rarely violent, but sometimes exposes himself to danger in endeavouring to effect his escape. Trembling of the lips, hands, and muscles is generally present, and more particularly in speaking, or on making any effort. There is profuse perspiration, a moist and slightly-furred tongue, and a small, quick, frequent, and compressible pulse. The countenance, in the majority of cases, is pale, and the manner of the patient composed and rational, even when describing symptoms and imaginary events likely to excite and interest persons in their right mind. In other cases decided symptoms of phrenitis, indicated by a hot head and flushed face, accompany the delirium. In fatal cases, the delirium lapses into the typhous state, the tremor passes into subsultus tendinum, and the evacuations become involuntary; or embarrassed respiration, and mucous râle usher in death by apnœa. The disease is very apt to recur.

The spectral and other illusions of the senses in the subjects of delirium tremens are in some respects peculiar. They generally have reference to animals. The patient will listen to the arm of a chair, believing it a serpent, or scratch it with his nail, alleging that it is the hiding-place of a scorpion. Sometimes he confounds inanimate with living objects on account of some single resemblance: thus a groom suffering from delirium tremens will lift up the leg of a table as if it were that of a horse, harness chairs with string, &c.

MORBID ANATOMY.—In traumatic delirium no morbid appearances. In death after repeated attacks of mania à potu, hardening of the brain, and a little more fluid than usual in the ventricles and subarachnoid spaces. In cases accompanied by symptoms of cerebral inflammation some fulness of the vessels and serous effusion. Alcohol has been detected in the serum of the ventricles.

CAUSES.—*Predisposing.* The immoderate use of alcoholic liquors, opium, or other narcotic drugs. Mental exhaustion from intense study or prolonged anxiety. The summer season.—*Exciting.* An occasional debauch; continued intemperance; sudden abstinence from an accustomed stimulant; loss of blood; all causes of debility; shock, physical or mental; severe wounds (delirium traumaticum). Diseases producing great exhaustion.

DIAGNOSIS.—From simple *meningitis;* by the absence of headache; a moist skin; trembling of the hands; illusions; the timid, suspicious, and excited manner, and generally by the absence of febrile and inflammatory symptoms. The distinction between meningitis and a form of delirium tremens coming on after a single debauch, or a comparatively short indulgence in habits of intoxication, is not so easily made, and, in extreme cases, the history of the patient and of the existing attack will be our only guide to treatment. When the respective diseases are well marked, there is no difficulty in the diagnosis.

PROGNOSIS.—*Favourable.* In proportion to the physical strength of the patient.—*Unfavourable.* If the pulse be small, weak, and intermittent, and opium induces little or no tendency to sleep.

TREATMENT.—*Indication.* I. To procure sleep. II. To sustain the strength. III. To reduce inflammation when present.

I. This indication is fulfilled by full doses of opium, or its preparations. Two or three grains of solid opium, or from half a drachm to a drachm of laudanum, followed at intervals of one, two, or three hours by a grain of opium, or from twenty drops to half a drachm of laudanum, till sleep is procured, is the appropriate treatment; other preparations of opium, in equivalent doses, may be substituted. The opium may be combined with ammonia, with wine, or with the patient's accustomed stimulant.

II. If the pulse be very feeble, ammonia and bark, beef-tea, brandy and eggs, must be freely administered. Large doses of digitalis have lately been recommended in delirium tremens, but it is a remedy of doubtful efficacy, and requires to be used very carefully.

III. Inflammatory symptoms are best treated by cold to the head and blisters to the neck. The bowels should be kept moderately open, avoiding the use of strong purgatives.

The patient should be watched, and the windows well secured by bars or shutters. One or two strong persons should be in attendance, and if there be any inclination to violence the strait waistcoat must be used.

CHAPTER II.

DISEASES OF THE CIRCULATING SYSTEM.

1. Of the Heart.
2. Of the Arteries.
3. Of the Veins.

DISEASES OF THE HEART.

1. Functional or Nervous Affections.
2. Structural or Organic Diseases.

1. FUNCTIONAL OR NERVOUS AFFECTIONS.

PALPITATIO	Palpitation.
SYNCOPE	Fainting.
ANGINA PECTORIS	Spasm of the Heart.

PALPITATIO—PALPITATION.

PALPITATION denotes frequent, strong, and tumultuous movements of the heart, without appreciable organic lesion. It is, however, a frequent symptom of organic disease of the heart. When existing in an extreme degree, the beats of the heart are both heard and felt by the patient, especially when lying on the left side; and they may even be seen by the bystander. They are sometimes accompanied by a slight and transient *bruit de soufflet*, which ceases when the heart becomes quiet. The palpitation is attended by a painful sensation of sinking, referred to the region of the heart or pit of the stomach, and spoken of as "a sinking of the heart." In some cases there is a tendency to syncope. Fits of palpitation often occur on first waking in the morning.

CAUSES.—*Predisposing*. The nervous temperament; the female sex.—*Exciting*. Strong emotions—joy, grief, anger, sadness, fear, anxiety. Violent exercise. Debility following chronic and acute diseases; excessive loss of blood; inordinate natural discharges; abuse of purgatives; dyspepsia, accompanied by flatulence; want of nourishment; intemperance; the excessive use of tobacco; want of sleep; anxiety and distress; intense study; dissipation and debauchery; excessive sexual intercourse; onanism (hence the frequency of palpitation among prisoners). In females, change of life.

Palpitation frequently accompanies valvular disease of the heart, and it is a prominent symptom in anæmia, hysteria, spinal irritation, mimosis inquieta, and leucorrhœa, in females; and plethora, dyspepsia, bronchitis, emphysema, and pulmonary consumption in both sexes.

Long before any other symptom of pulmonary consumption has made its appearance, the patient will often complain of distressing palpitation; and this is so common, that palpitation, not otherwise really accounted for, should lead to an examination of the lungs.

Chlorotic girls are often supposed to labour under organic disease of the heart, when there is only functional disturbance. They complain of palpitations, difficulty of breathing, and pain in the left side, and are sometimes leeched, cupped, and blistered when they require an opposite treatment. In females suffering from spinal irritation, the heart is often very irritable, and the pulse may exceed 160 in the minute.

DIAGNOSIS.—The absence of the physical signs of organic disease; the peculiarly distinct character of the sounds of the heart; the absence of inequality and irregularity of the pulse (except in rare cases of dyspepsia); the intervals, the entire freedom, the great frequency of the pulse when the finger is first placed upon it, and the gradual diminution which follows as the patient's apprehension disappears.

TREATMENT.—Idiopathic palpitation in plethoric individuals may require the abstraction of blood from the arm, or by leeching or cupping to the region of the heart, followed by saline aperients, low diet, and rest. In most cases the medicinal and hygienic treatment will be that appropriate to *anæmia chlorosis* and *mimosis inquieta.* But in obstructive pulmonary diseases, and in valvular diseases of the heart itself, the palpitation, which was at first but a symptom of these diseases, may subsequently become a cause of their aggravation, and our first endeavour must be to subdue the excitement of the heart. When its action is very tumultuous and irregular, much benefit may be expected from digitalis or hydrocyanic acid. An anodyne plaster of belladonna or opium may at the same time be applied to the præcordia.

In persons subject to nervous palpitations, it is of the first importance to procure tranquillity of mind; and as a fear of organic disease of the heart is often present, the assurance of the medical man that the heart is free from structural disease will go far to effect a cure.

Irregular and intermittent pulsations of the heart often arise from the causes which produce nervous palpitations, especially from dyspepsia attended with flatulence, and are relieved by the same remedies. But they may depend on organic disease of the heart.

The pulse at the wrist and heart may be irregular and intermittent during health, become regular during acute disease, and return to its former condition during convalescence or recovery.

Pulsation in the epigastrium is usually produced by flatulent distension of the stomach, and is removed by carminative aperients. (Forms. 263, 282.)

ANGINA PECTORIS—BREAST PANG.

SYNONYM.—Syncope anginosa.

DEFINITION.—Sudden and acute pain in the chest, referred to the sternum, accompanied by intense anxiety and fear of death.

SYMPTOMS.—This disease generally occurs in persons having every appearance of good health. It consists of fits, or paroxysms, which come on during exercise, especially when walking up an ascent against the wind, or after a full meal. The attack is announced by a sudden and violent pain across the chest, extending down the left arm, or down both arms as far as the insertion of the deltoid muscles, and, in some cases, to the wrists, or fingers, accompanied with a sense of stricture so acute as to threaten immediate destruction. The patient is instantly obliged to stand still, and the moment he does so all the symptoms vanish. After repeated attacks, the fits, excited by slighter causes, are more violent and last longer. They often occur on the patient's waking from his first sleep, and he is, at times, incapable of lying down. At length, a fit more violent than usual puts an end to his existence, or death takes place suddenly without pain or any other warning.

MORBID APPEARANCES.—Defective supply of blood to the muscular tissue of the heart, from absence of one or ossification of both coronary arteries, or of the valves; morbid accumulation of fat; atrophy of the heart, from fatty degeneration. In a few cases the disease has been caused by the pressure of tumours in the chest; in a few others it has been unexplained by any morbid appearance, and death has been attributed to spasm of the heart.

CAUSES.—*Predisposing.* The male sex; age above 50: it is rare in women. (Of nearly a hundred cases, three only occurred in women, and one in a boy twelve years old. The rest were men, near or past 50 years of age.—Heberden.)—*Exciting.* Violent exercise, strong mental emotion, and excess of all kinds: flatulence.

DIAGNOSIS.—The suddenness of the attack, the acute pain, and the intense anxiety, are highly characteristic, and distinguish it from simple palpitation.

PROGNOSIS.—The probable termination of the disease is sudden death. This usually occurs without pain, the person being found in bed as if composedly asleep. The fatal event is often postponed to an advanced age. In a small number of cases the disease is transient.

TREATMENT.—*Indications.* I. In the paroxysm, to revive the failing action of the heart. II. In the interval, to regulate and invigorate its movements.

The first indication is fulfilled by the immediate administration of stimulants and antispasmodics, such as æther, ammonia, brandy and water, and strong coffee. The patient should always have at hand some diffusible stimulus, or combination of a diffusible stimulus with an opiate. (Form. 119.)

To meet the second indication the patient should be directed to lead a quiet life, to put away all anxiety and excitement, and to avoid hurry, strong muscular exertions, and walking up hill. The diet should be light and nutritious; food should be taken often, and in small quantities. Whenever a feeling of weariness comes on, a little wine or brandy should be taken. Attention must be paid to the general health, and especially to the pulmonary circulation.

A sudden sharp pain in the region of the heart sometimes attacks nervous and dyspeptic persons. It has been attributed in some cases, and with apparent reason, to excessive indulgence in strong tea. The pain is not attended with the extreme anxiety of angina pectoris, and does not extend beyond the region of the heart. The treatment of this affection must depend on the state of the patient's health, and the ascertained cause of the individual paroxysms. Benefit is often derived from the application of a belladonna plaster to the region of the heart.

Spasm of the heart is described by Laennec, though considered an imaginary disorder by Bouillaud, who states that there is no positive fact to attest its existence. But there is no reason why the heart should not suffer from spasm as well as other muscular organs.

The muscular structure of the heart would also seem to be the occasional seat of rheumatism; the symptoms being constant dull pain, increased at intervals, and palpitation, without any abnormal sound. In such cases, a blister is indicated.

SYNCOPE—FAINTING.

Symptoms.—A person about to be attacked with syncope experiences an indescribable distress. The sight fails, and objects appear to swim before the field of vision; there is a sense of singing or buzzing in the ears; the lips and countenance become pale; a cold perspiration bedews the whole body; and the patient, if unsupported, falls senseless to the ground; the pulse and breathing are almost imperceptible. In some cases, not the smallest sign of life can be perceived, the face has a death-like pallor, the extremities are cold, the eyes closed, and the limbs flaccid. Recovery is announced by deep, prolonged sighs, is frequently attended with vomiting or purging, or it may pass into epileptic convulsions.

In milder cases the loss of sense is incomplete, the pulse is diminished in force and volume, the patient merely becomes pale and sick, and drops of sweat appear upon the brow.

Diagnosis.—Syncope does not usually continue longer than a few seconds, but in some cases it persists for several minutes. In hysterical yncope the pulse beats as usual, the skin is warm, there is no pallor f countenance, and the eyelids vibrate.

CAUSES.—*Predisposing.* A nervous and delicate constitution; debility; profuse evacuations, especially of blood; functional or organic diseases of the heart.—*Exciting.* Strong emotion; severe pain; loss of blood.

TREATMENT.—Purely nervous syncope is rarely dangerous. The recumbent posture, a draught of fresh air, cold water sprinkled on the face and neck, and ammonia to the nostrils, will soon restore animation. Such articles of dress as impede respiration should be immediately loosened. Hysterical syncope must be treated by cold affusion.

When fainting fits are the result of diseases of the heart, the same remedies must be employed, and ammonia or hot brandy and water administered internally.

Since chloroform causes death chiefly by paralysing the heart's action, a few words on its administration, and the treatment of the state of profound syncope sometimes induced by it, will be appropriate in this place.

Precautions to be used in the administration of Chloroform.—1. The chest of the patient should be carefully examined, and if there be valvular defect of the heart, or intermittent action from debility or atrophy, or if there be any obstruction to the free action of the lungs, from tumours, interstitial deposits, and *especially from emphysema*, chloroform must not be administered.

2. The inhaler should be so constructed as to secure a rate of evaporation as nearly equal as possible; and to guard against the air in the reservoir becoming charged with more than six per cent. of chloroform vapour. The instrument contrived by Dr. Sansom, and made by Mr. Matthews, provides these essential safeguards.

3. The receptacle for the chloroform should be on a lower level than the patient's mouth, and should be carefully kept upright, otherwise the unmixed vapour of the chloroform, which is four times heavier than air, will flow undiluted into the lungs of the patient.

4. The finger should remain on the pulse, and the eyes be steadily directed to the chest and face during the whole of the process. If the pulse intermit, or fall below 60; if the breathing become abnormally slow, or feeble and shallow, or the countenance livid, the inhalation must be promptly stopped.

The state of insensibility which it is desired to induce should have the following character. Pulse and breathing tranquil, and the expression of the countenance that of ordinary sleep; but if there have been much noisy struggling in the first stage, it may appear a little congested. The eyelids closed and insensible, the eyeball fixed, and the pupil contracted, but respondent to the stimulus of light. The skin insensible and the limbs flaccid.

Chloroform kills by paralysing the heart, and death usually takes place with great rapidity, the breathing and pulse rapidly becoming slower, and, in a few seconds, imperceptible; the pupils dilated and insensible to light; the face pale and sometimes livid.

The *post-mortem appearances*, due to the effect of chloroform, are congestion of the lungs, an empty and flaccid condition of the heart, and a fluid state of the blood.

The *means of resuscitation* should always be at hand, to be promptly employed if the formidable symptoms just mentioned appear. They are strong ammonia, hot and cold water, artificial respiration, electricity. While ammonia is being applied to the nostrils and mouth, and a large sponge saturated with almost boiling water to the region of the heart, cold water should be dashed in the face, and artificial respiration employed, the tongue being pulled forcibly forwards. If these means fail, electricity (by means of the magneto-electric apparatus) may be applied to both sides of the body simultaneously—one electrode being placed on the neck, the other on the chest, so as to direct the current from above downwards.

STRUCTURAL DISEASES OF THE HEART AND PERICARDIUM.

Pericarditis . .	Inflammation of the Pericardium.
Endocarditis . .	Inflammation of the Endocardium.
Carditis . . .	Inflammation of the Substance of the Heart.
Atrophy . . .	Fatty Degeneration of the Heart.
Diseases of the Valves of the Heart.	
Hypertrophy . .	Enlargement of the Heart.
Dilatation . .	Of the Heart.
Cyanosis . . .	Blue Disease.
Entozoic Disease of the Heart.	

PERICARDITIS—INFLAMMATION OF THE PERICARDIUM.

Varieties.—1. Acute. 2. Chronic.

1. ACUTE PERICARDITIS.

Idiopathic pericarditis is of very rare occurrence. The disease is commonly an accompaniment of acute rheumatism.

Symptoms.—After rigors, which are sometimes extremely severe, pain, more or less acute, under the left nipple and towards the inferior extremity of the sternum, occupying a part or the whole of the præcordial region, radiating towards the left axilla and arm, and sometimes extending down the left arm to the elbow or wrist. The pain may be pungent and lancinating, or dull and obscure ; or there may be merely a feeling of oppression. When pain is present, it is increased, when absent, often produced, by deep pressure in the intercostal spaces over the region of the heart, by upward pressure against the diaphragm, or by an attempt to lie on either side. There is also violent and often irregular palpitation.

In addition to the cardiac symptoms, there is more or less fever ; a frequent, full, hard, regular, and *jarring* pulse, or a small, unequal, irregular, and very rapid one; dyspnœa, or respiration interrupted by sighs, sobs, or hiccough; an insupportable sense of oppression, restlessness, jactitation, and an urgent want of fresh air; the skin may be bathed in sweat, or very dry and hot; the countenance is pale, sharpened, and expressive of extreme anxiety. Sometimes there are attacks of partial convulsions, or a slight and momentary delirium, and if the patient sleep he awakes with fearful dreams; in other cases there is complete insomnolence. The anxiety and agony are sometimes so insupportable that the slightest motion occasions an apprehension of sudden death. When the disease proves fatal, the breathing becomes more and more laborious, the countenance livid, the eye glassy, the skin covered with a clammy sweat.

TERMINATIONS.—1. In complete recovery. 2. In chronic pericarditis. 3. In adhesion of the pericardium. 4. In death.

MORBID ANATOMY.—Effusion of serum, with shreds of coagulable lymph, or with pus, sometimes tinged with blood; rough deposits of lymph on the membrane; slight soft adhesions between the two surfaces. In many cases, endocarditis, more or less extensive.

DIAGNOSIS.—The disease is apt to be confounded with pleuritis, pneumonia, or even with simple fever. When the *physical signs* are well marked, the diagnosis is easy.

Auscultation.—Within a few hours, or one or two days of the commencement of the disease, a superficial *to-and-fro* sound (*bruit de frottement*), caused by the rubbing of the inflamed surfaces of the pericardium, corresponding to the two sounds of the heart, and resembling the sound caused by rubbing the hands backwards and forwards against each other. When the secretion of lymph is more consistent, the sound resembles the creaking of new leather (*bruit de cuir*), or in still more marked cases, that of a file or rasp (*bruit de scie, bruit de râpe*). As the secretion into the sac of the pericardium increases, or if the opposite surfaces become adherent, the to-and-fro sound disappears. The sound is first heard a little to the left of the mesial line, and about the centre of the sternum, whence it gradually extends over the whole præcordial space. It is often accompanied by a bellows sound synchronous with the systole of the heart, and this, which is *endocardial*, often remains when the to-and-fro sound has ceased. Sometimes it is very difficult to determine whether the sound be *endo-* or *exocardial.* The exocardial sound may be distinguished—1. By its nearness to the surface. 2. By its independence of the rhythm of the heart. 3. By its limitation to the region of the heart—endocardial sounds are frequently prolonged over the great vessels. 4. By its occasional disappearance and change of character. *Percussion* detects præcordial dulness, coextensive with the effusion. When there is much liquid effusion, the sounds of the heart are at first muffled, and in proportion as it increases, they become less and less distinct, till, in extreme cases, they are almost inaudible.

PROGNOSIS.—Complete recovery only occurs in those cases in which the effusion is fluid. Solid effusions generally lead to some roughening of the pericardium, or adhesion of the opposed surfaces.

CAUSES.—*Predisposing.* Hereditary tendency to rheumatic and gouty affections; male sex; from 10 to 30.—*Exciting.* Cold, and, in most cases, the extension of acute articular rheumatism; neighbouring inflammations of the pleura and lungs; renal disease; pyæmia.

TREATMENT.—*Indications.* I. To subdue the existing inflammation. II. To promote the absorption of effused matters.

I. The first indication is fulfilled by general or local bleeding, according to the strength and state of the patient. If the disease come on suddenly in a vigorous plethoric person, blood may be taken from the arm, so as to make a decided impression on the pulse; and this may be followed by cupping, or leeches over the heart. But if the disease supervene, as it generally does, in the course of an attack of acute rheumatism, or in one whose strength is already reduced, topical bleeding by cupping or leeches will suffice. In no case should depleting measures be carried to excess. They may be assisted by purgatives, rest, and the antiphlogistic regimen; and when the depletion has been carried to the proper extent, a blister may be applied over the region of the heart, and kept open some time by savin ointment.

II. The second indication is fulfilled by mercury freely given every one, two, or three hours, in combination with opium, and accompanied by mercurial inunction, till the gums are sore. In very acute forms of idiopathic pericarditis, the mercury may be combined with tartar emetic in doses of $\frac{1}{6}$ to $\frac{1}{4}$ of a grain. Rheumatic pericarditis should be treated with blisters and the appropriate remedies.

2. CHRONIC PERICARDITIS.

SYMPTOMS.—Palpitation and dyspnœa, accompanied sometimes by dry cough; inability to lie on the left side; slight pain or uneasiness in the region of the heart; sense of oppression; great debility; and slow and imperfect convalescence, or a fatal termination in hydropericardium.

CAUSES.—Chronic pericarditis is generally a sequela of the acute form of the disease; and is especially apt to follow an attack of acute rheumatism. The symptoms are sometimes very obscure.

TREATMENT.—Blisters to the region of the heart. In the rheumatic, the appropriate eliminatives; in the debilitated, iron, in combination with iodine or quinine. During convalescence violent exercise should be avoided, and a nourishing, unstimulating diet allowed.

SEQUELÆ.—Important structural changes often remain when the symptoms of pericarditis, whether acute or chronic, have been removed. The pericardium may be thickened, and the subjacent capillary vessels enlarged. There may be serum, or lymph, or pus in the pericardium, adhesions, partial or general, and organised deposits of fibrine, in the form of granulations and vegetations. The false membranes may become fibro-cartilaginous, or even osseous. The effused fluid, or the thick false membranes, embarrass the action of the heart. The muscular tissue may, like the serous, fibrous, and cellular tissue of the heart, become thickened, and hypertrophied, indurated or softened, by the extension of the inflammation from the pericardium (see Carditis).

These changes may be detected by careful stethoscopic examination. The superficial to-and-fro sound of acute pericarditis is generally absent. The denser deposits on the surface of the pericardium are indicated by harsher and louder sounds, corresponding to the apex or base of the heart. Partial adhesions of the two layers of the pericardium are sometimes productive of no unusual sounds; at others, of some modification of the friction sounds. Extensive adhesions of the two layers of the pericardium generally lead to irregular action of the organ, and are accompanied by a well-marked retraction of the epigastrium, and hollowing of the intercostal spaces with each systole of the heart; and the heart's beat continues to be perceptible in the same spot, in all positions of the body, and in all states of the respiration. Extensive effusion into the sac of the pericardium constitutes Hydro-pericardium.

HYDRO-PERICARDIUM.

VARIETIES.—1. Active, from inflammatory action. 2. Passive, from obstruction to the circulation.

The symptoms of the *passive* form are generally obscure. They are, a sense of weight and oppression in the præcordia, great dyspnœa, a dusky, suffused countenance, a tendency to syncope, œdema, and a small, frequent, irregular pulse. The patient usually sits up in bed, afraid of the least exertion, or slightest change of position.

LOCAL SIGNS.—When the effusion is considerable, prominence of the præcordia, with bulging of the intercostal spaces, extensive dulness, reaching sometimes from nipple to nipple and nearly the whole length of the sternum; the pulsations of the heart imperceptible when the patient lies down, and shifting their place in the erect and sitting posture; the sounds indistinct in the region of the heart, but more audible at the upper part of the chest; the dulness varying its situation and extent with the posture.

PROGNOSIS.—Extremely unfavourable.

TREATMENT.—That of dropsies in general, by drastic purgatives and diuretics, modified according to the state of the patient and existing complications, and assisted by large blisters to the region of the heart, kept open by savin ointment. In a few cases, where the accumulation of serum has been very large, and the disease is free from other visceral complication, tapping has been practised with success. The spot selected for the operation is the fifth intercostal space, through which a trocar of small size is introduced—from below upwards.

ENDOCARDITIS—INFLAMMATION OF THE ENDOCARDIUM.

Symptoms.—General feeling of uneasiness, anxiety, and oppression at the præcordia, with a tendency to syncope; but no pain, unless the disease be complicated with pericarditis or pleurisy. In the more severe cases there is well-marked fever, hot and dry skin, thirst, and restlessness; violent and irregular action of the heart, with a small, feeble, and often intermittent pulse; jactitation; cold sweats; pale and shrunken features, expressive of extreme alarm; dyspnœa, faintness. or actual syncope; lividity of the lips and cheeks; slight swelling of the hands and feet; and short convulsive seizures.

Morbid Anatomy.—1. Redness of the endocardium, sometimes general, but more frequently partial; often confined to the valves, and generally accompanied by some thickening infiltration, and softening of the membrane. 2. Effusion of white, elastic, glutinous masses of coagulable lymph, firmly attached to the free borders of the valves, adherent to the parietes, entwined round the valvular tendons and fleshy columns, and often prolonged into the large vessels. 3. Vegetations or granulations, varying in size from that of a millet-seed to that of a small pea, single or clustered, smooth or rough, and when very numerous resembling the head of a cauliflower, on the free borders of the valves, and sometimes on the surface of the cavities. 4. These valvular vegetations are often accompanied by fibro-cartilaginous or calcareous indurations, which contract the orifices of the heart so as to impede the circulation of the blood, and cause cardiac dropsy. Sometimes the opposite borders of the valves are adherent.

Causes.—Those of pericarditis, which it often accompanies.

Diagnosis.—The stethoscopic indications mentioned under diseases of the valves. The murmurs are generally of a low pitch, and are sometimes musical. We cannot be sure of the existence of *acute* endocarditis unless the murmur be developed under observation.

Prognosis and Terminations.—The disease is rarely fatal in its acute stage. Its duration is uncertain, and much influenced by the habits of the patient. It may continue for years, with slowly increasing embarrassment of the circulation; forming *chronic valvular disease*, with *hypertrophy*, and ending either in sudden death or in dropsical effusions. If particles of fibrinous exsudation become detached from the inflamed valves and carried along in the arteries, they may eventually block up some of the smaller branches, and thus produce the condition known as *embolism* and its consequences. (See page 442.)

Treatment.—That of pericarditis, and in the acute form, in vigorous subjects, active and prompt treatment is still more necessary.

When endocarditis becomes chronic without organic disease, the symptoms may be alleviated by small and repeated bleedings, cupping or leeching; gentle aperients; counter-irritants; the warm bath repose; and a strictly-regulated diet.

CARDITIS, OR MYO-CARDITIS.

SYMPTOMS.—Carditis, or inflammation of the substance of the heart, rarely occurs as a distinct affection, and the post-mortem appearances which characterise it have generally been found combined with pericarditis, or endocarditis, or both. The muscular tissues of the heart may, however, be separately affected, as are the ordinary muscles in muscular rheumatism.

Palpitation, with strong and abrupt contractions of the organ, a very frequent, full, and bounding pulse, and a dull heavy sensation in the region of the heart, with paroxysms of severe darting or shooting pain in the heart itself, extending to the shoulders and down to the arms, with some degree of dyspnœa, are the symptoms that may be expected in this disease. Muscular rheumatism in other parts of the body may be looked for.

I have known such symptoms supervene on a severe attack of muscular rheumatism, without any indication of inflammation in the pericardium or endocardium. The treatment would be that of muscular rheumatism, with counter-irritation to the region of the heart, and, in the most severe cases, general or local depletion. (G.)

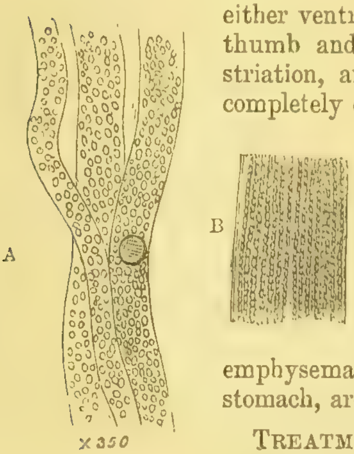
The symptoms during life are often very obscure. After death we may find softening, suppuration, ulceration, and perforation of the cardiac parietes.

ATROPHY OF THE HEART.

SYMPTOMS.—Occasional fainting, and transient attacks of giddiness, in some cases, and the symptoms of angina pectoris in others. The most common termination is in sudden death under change of posture or slight exertion, the patient having previously suffered from debility, with great pallor of countenance and anasarca; but in some instances he is stout and apparently healthy. The respiration is sometimes affected in the manner described at p. 187. The pulsations of the heart are small and feeble, the impulse much weaker than natural, and scarcely felt by the hand, and the sounds indistinct. The least exertion renders the heart's action fast and irregular, and then the impulses become so feeble that some of them are not appreciable at the wrist. The pulse is very compressible, intermittent, and small, and, in a state of quietude, commonly below the natural frequency.

CAUSES.—*Predisposing.* The male sex; age above 50; habits of intemperance, combined with a sedentary life; exhausting diseases, such as hæmorrhage, typhus fever, pulmonary consumption, emphysema, of long standing, and dropsy.—*Proximate.* Compressions of the heart by deposits of fat, by effusion of fluid, by tumours; carditis; disease of the coronary arteries, or congenital absence of one of them.

Fig. 54.



Morbid Anatomy.—Fatty degeneration of the muscular tissue of the heart, which is found soft, flabby, and of a dirty dark-brown, or pale drab colour. When incised a greasy film is left on the scalpel. In extreme cases the wall of either ventricle may be broken down between the thumb and finger. The fibres lose their faint striation, and the sarcous matter is more or less completely changed into fat, observable in the form of distinct highly refractive spherules. (Fig. 54. The early, B, and the latter stages, A, of fatty degeneration of the muscular fibres of the heart. In B the oily particles are arranged in rows, in A they are irregularly distributed.) Fatty degeneration of the liver and kidneys, and of the aorta, emphysema of the lungs, and ulceration of the stomach, are frequent concomitants.

Treatment. — Nutritious diet, with tonics (Form. 144), and stimulants (Form. 2), and brandy; carriage exercise. Great watchfulness on the part of the attendants, if the condition be suspected during life. The disease does not admit of cure.

DISEASES OF THE VALVES OF THE HEART.

Symptoms.—When the valves of the heart are the seat of disease, the blood is not only impeded in its flow out of the heart, but from defective closure of the valves is subject to reflex (regurgitation). The obstruction to the circulation of blood through the heart thus set up leads to hypertrophy of the organ, and sooner or later to congestion of the lungs or other viscera, ultimately ending in grave diseases, of which dropsy is the prominent symptom. The symptoms attendant on valvular disease are by no means uniform; they vary with the valve which is the seat of the disease, and with the nature, extent, and duration of the morbid change itself. The general symptoms are tumultuous palpitation, a frequent pulse, a sense of weight, tightness, and oppression, sometimes accompanied by pain in the region of the heart and at the epigastrium; dyspnœa; an inability to lie on one or both of the sides; flatulency; frequent feelings of faintness and giddiness, or fits of syncope; an anxious expression of countenance, with slight knitting of the brows: the countenance sometimes pale, sometimes suffused. These symptoms are greatly increased by active exertion, walking up hill, or mounting stairs, and by violent mental emotion. In order to ascertain the effects of valvular disease upon the several parts of the circulation, and their influence in the production of disease of the viscera, it will be necessary to consider each valve separately, premising these two facts: first, that disease may affect more than one valve simultaneously; secondly, that while the valves on the left side are particularly prone to disease, those on the right are very much less liable to it.

Disease of the right auriculo-ventricular (tricuspid) valve, allowing regurgitation from the ventricle into the auricle.—Proximate effects. Slight hypertrophy of the right cavities, and increased præcordial dulness to the right; epigastric and right sternal impulse. A soft *systolic* murmur at the ensiform cartilage.—*Remote effects.* Cervical veins distended, varicose, and pulsatile; when a finger is pressed upon them, they do not become empty below it; congestion of the venous circulation, producing corresponding obstruction to the arterial. The brain becomes oppressed and the patient suffers from congestive headache, and is liable to apoplexy. The liver becomes engorged with blood and enlarged; and, as sequences, the portal circulation is impeded, and the mucous membrane of the stomach and intestines congested. Thirst, piles, and the passage of blood from one or other, or from both extremities of the alimentary canal, are symptoms of this condition. The kidneys do not long escape congestion; hence the urine becomes scanty, and sooner or later albuminous: ascites, œdema of the legs, and at last general anasarca, follow the congestion of the internal organs.

Disease of the right auriculo-ventricular orifice obstructing the flow of blood from the auricle into the ventricle.—If the tricuspid orifice be merely constricted, the action of the valves remaining perfect, there would be but slight congestion of the venous circulation without pulsation in the veins, and a *diastolic* murmur would probably be heard at the ensiform cartilage. But such a condition is exceedingly rare.

Disease of the pulmonary valves with permanent patency.—Proximate effects. Hypertrophy of right cavities of the heart and its signs; and "along the sternum a well-marked *double murmur*, similar, in every respect, to that observed in the ordinary case of permanently open aortic valves, loudest at the base of the heart, and becoming less distinct as the stethoscope is moved towards the apex, where it ceases to be audible." (Stokes.)—*Remote effects.* Dyspnœa, palpitation, some venous congestion.

Disease of the pulmonary valves obstructing the passage of blood into the lungs.—If the pulmonary orifice become contracted, the pressure of accumulated blood in the right ventricle will lead to regurgitation into the right auricle, followed by general venous congestion, as detailed under regurgitant disease of the tricuspid valve.

Disease, and also congenital deficiency of the pulmonary valves are very rare.

Disease of the left auriculo-ventricular (mitral) valve, permitting regurgitation from the ventricle into the auricle.—Proximate effects. Enlargement of the left ventricle; increased præcordial dulness towards left side; apex-beat lower and more to the left; impulse greatly increased, often giving rise to a perceptible systolic thrill. A *systolic* murmur partially or completely obscuring the first sound of the heart, most distinct at the apex, and hardly or not at all heard at the base.—*Remote effects.* The arteries do not receive their full share of blood, and the pulse is consequently small and contracted; congestion of the lungs.

Disease of the left auriculo-ventricular orifice, causing obstruction to the flow of blood into the ventricle.—If the mitral disease result in *contraction of the left auriculo-ventricular orifice*, as is sooner or later the case, pulmonary symptoms in proportion to the contraction supervene. The lungs become congested, and there is constant liability to pulmonary hæmorrhage, evidenced by pulmonary apoplexy, or hæmoptysis, often to a large amount. Dyspnœa is often very urgent; bronchitis is a chronic symptom. Sooner or later the obstruction to the pulmonary circulation is felt on the right side of the heart, its cavities become enlarged, general venous congestion ensues, and its ultimate result, anasarca, appears. A soft *diastolic* murmur, best heard at the apex, and not masking the second sound, is diagnostic of contracted mitral orifice. Later on, when the heart becomes enfeebled and the orifice much contracted, the murmur may be no longer heard.

Disease of the aortic valves obstructing the exit of blood from the left ventricle (*constriction of the aortic orifice*).—*Proximate effects.* Great hypertrophy of the left ventricle; systolic thrill; strong heaving impulse; a loud harsh *systolic* murmur at mid-sternum, inaudible, or nearly so, at apex.—*Remote effects.* If the constriction be great, the pulse, though regular in force and rhythm, is small, hard, rigid, concentrated; hardness and force imply hypertrophy. Weak action of the heart, or extreme smoothness of the constricted orifice, may prevent the development of murmur, and the opening may be no larger than a pea, without leading to the slightest œdema, even of the ankles. (Walshe.)

Disease of the aortic valves preventing the closure of the orifice, and therefore allowing of regurgitation.—*Proximate effects.* Greatest hypertrophy of the left ventricle, and corresponding heavy prolonged impulse; diastolic and systolic thrill. A systolic, or diastolic murmur, or both, obliterating the first or second, or both sounds of the heart, heard best at mid-sternum. The systolic murmur is distinctly heard in an upward direction towards the right shoulder; it is inaudible, or nearly so, at the apex. The diastolic murmur is best heard in a downward direction towards the apex, where it may become faint, or be still strongly pronounced.—*Remote effects.* A characteristic sudden jerking pulse. The pulsation of the superficial vessels is visible, and accompanied by considerable movement; slight pressure upon them often produces a sensible thrill.

Of all the affections of the valves of the heart this produces the least injurious effect on the circulation. Of itself it never causes dropsy.

MORBID ANATOMY.—Dilatation of the orifices, and incomplete closure by the valves; partial adhesion of the valves; contraction of the orifices with rigidity and roughening of the valves from fibrinous, atheromatous, cartilaginous, or bony deposits within their substance. Rupture of the valves or chordæ tendinæ.

DIAGNOSIS.—*Disease of the several valves and orifices* may be correctly diagnosed if attention be paid to the following points:—

1. The left side of the heart is much more frequently affected than the right.—2. Generally, when the right side is the seat of disease, the left side is affected also.—3. Diseases of the right side chiefly affect the venous circulation, causing regurgitation into the jugular veins (the *venous pulse*).—4. Diseases of the left side affect chiefly the arterial pulse, giving rise to irregularity and inequality.—5. Disease of the right side generally leads to dropsical effusions; disease of the left side to affections of the lungs; and disease of the aorta to head symptoms.—6. Sounds, whether on the right or left side, which accompany or take the place of the first sound of the heart, and are synchronous with the pulse, are due to the passage of the blood out of a ventricle—that is to say, to regurgitation into the auricle, or onward movement into the artery of the side affected.—7. Sounds, whether on the right or left side, which accompany or take the place of the second sound of the heart, and are not synchronous with the pulse, are due to the entrance of blood *into* the ventricles, in consequence of the contraction of the corresponding auricles, or to regurgitation from the corresponding arteries.—8. Sounds heard at the base of the heart and in the course of the aorta towards the right clavicle, becoming less audible towards the apex, indicate disease of the valves or coats of the aorta. If the sound accompany the contraction of the ventricle, and be synchronous with a regular, equal, *thrilling* pulse, it is due to disease of the valves or coats of the aorta; but if the sound accompanying the diastole of the ventricle be not synchronous with the pulse, which is, at the same time, abrupt and *jerking*, and the abrupt second sound of the heart be absent or very obscure, the sound is due to reflux through the open aortic valves.—9. If, on the other hand, the sound be synchronous with the systole of the ventricle, and with the pulse, which, at the same time, is wanting in volume, the sound is due to reflux from the left ventricle, through a diseased mitral valve, into the left auricle; but if the sound be not synchronous with the contraction of the ventricle, it is due to the passage of the blood from the auricle to the ventricle, through a diseased mitral valve.—10. The same rules apply to the right side of the heart. If the disease were in the pulmonary artery, the sound would be heard in the track of that vessel, towards the left clavicle.

CAUSES.—Rheumatic fever, chronic rheumatism, gout, Bright's disease of the kidneys, violent exertion, obstruction to the pulmonary circulation, atheromatous degeneration of the valves or great blood-vessels, aneurism of the aorta or pulmonary artery.

TREATMENT.—Must be directed to regulate the action of the heart and to prevent the tendency to dropsy, by relieving the systemic congestion. It is effected by hydragogue purgatives, the occasional and cautious abstraction of blood by a small orifice, great moderation in diet, and an abstinence from all violent exertions and strong mental emotions. In the more advanced stages of the disease the treatment must be suited to the existing complications. The general principle of the treatment will be to avoid all excitement of the circulation, and all remedies which impair the power of the heart; and, at the same time, to relieve any unusual embarrassment of the circulation by moderate depletion. Undue action of the heart may be moderated by the internal use of digitalis, and the external application of belladonna or opium plasters.

HYPERTROPHY OF THE HEART.

This is the direct result of obstruction in some part of the circulation, of which it is, therefore, merely a symptom. The hypertrophy is due to the increased exertion made by the heart to overcome the obstruction to the flow of the blood. It may affect the whole heart, or be limited to one or other of its chambers.

The hypertrophy is usually accompanied by dilatation of the cavity or cavities.

Symptoms.—Since the hypertrophy exactly compensates the obstruction, its effects involve the heart alone. The symptoms, therefore, which are associated with hypertrophy must be referred to the diseases which produce it, and not to the hypertrophy itself. The *physical signs* of enlargement of the heart are very distinct.

Physical Signs.—The impulse of the heart is greatly increased, is prolonged, and extends over a large space. It is visible to the eye, and forcibly raises the stethoscope; the first sound is obscure, when there is little or no dilatation; louder, more abrupt, and heard over a larger space when the dilatation is considerable; the second sound obscure in the former case, unusually distinct in the latter. There is dulness, varying with the degree of enlargement, and most extensive where dilatation is combined with hypertrophy. In some instances there is prominence and increased breadth of the left side of the chest. When the right side of the heart is affected, the dulness is most marked over the lower part of the sternum, and the impulse is felt in the infra-sternal fossa.

Causes.—Violent exertion; prolonged efforts, as in gymnastic exercises; plethora, valvular diseases and obstruction of the large vessels or in the heart itself; pericarditis and endocarditis; chronic diseases of the lungs, especially emphysema; diseases of the kidney.

Prognosis and Treatment have reference to the diseases which produce the hypertrophy. (See Valvular Disease of the Heart.)

DILATATION OF THE HEART.

Definition.—Dilatation of the cavities of the heart without corresponding increase of muscular tissue.

Symptoms *of dilatation with thinness of the parietes.*—This is most common on the right side; and is characterised by fluttering of the heart, and a full, frequent, weak, and irregular pulse. In extreme cases swelling of the veins of the neck, and distinct venous pulse; great dyspnœa; a dusky skin; a bloated and anxious countenance; drowsiness; slight delirium; dropsical effusions.

Physical Signs.—Impulse feeble, short, and flapping, or tremulous, felt over a greater extent than usual; first sound short and peculiarly distinct, heard over a great extent of chest both before and behind.

Causes.—Debility, anæmia; chronic diseases of the lungs; emphysema; especially valvular diseases of the heart.

Treatment.—Tonics. Repose of body and mind, careful regulation of the diet, aperients. Gentle opiates and sedatives may occasionally be of service to allay irritability; dry cupping if there be urgent dyspnœa.

Partial dilatation, or *true aneurism* of the heart, consists in a protrusion of some part of its walls from disease of the muscular tissue. It is an equally rare, obscure, and fatal disease, differing little from those of more general dilatation of the cavities in the symptoms. The physical signs are obscure; the prognosis, when the disease is recognised, is in the highest degree unfavourable, and the treatment similar to that for more general dilatation—complete repose of body and mind, the cautious use of narcotic and sedative remedies, and, in cases of extreme urgency, cautious depletion. When the aneurism bursts, effusion into the pericardium takes place; the rupture is announced by a piercing cry of anguish, and usually instantaneous death.

CYANOSIS—BLUE DISEASE.

Symptoms.—A blue tint of the skin, lips, mouth, and tongue; universal coldness of the surface; palpitation; fits of extreme dyspnœa; faintness, or actual syncope, on slight exertion, or from mental excitement; feeble and irregular pulse; œdema or dropsical effusions.

Morbid Anatomy.—Various congenital deficiencies and malformations. A communication between the two sides of the heart, or between the two sets of vessels arising from it, with disproportionate strength of the two ventricles, generally combined with narrowing of the pulmonary artery. Extreme contraction of the pulmonary artery alone. Transposition of the aorta and pulmonary artery.

Physical Signs.—A very loud and superficial murmur immediately over the seat of the communication.

Prognosis.—Death during a paroxysm at an early age; in rare instances the patient attains the adult age; and in one case recorded by Louis, the age of fifty-seven.

Treatment.—Rest of mind and body; pure air; warm clothing; strict diet; careful attention to the state of the stomach and bowels; and cautious treatment of complications.

DEVELOPMENT OF ECHINOCOCCUS IN THE HEART.

This is a rare disease; but as it may simulate valvular disease of the heart, tubercular disease of the lungs, embolism, disease of the arteries, &c., it is worthy of consideration here. The symptoms vary with the situation of the cyst, and are urgent and characteristic according as it ruptures into the right or left ventricle. The patient is usually well nourished. When the cyst ruptures into the right ventricle, pulmonary symptoms—urgent dyspnœa, bloody expectoration, severe pain in the præcordia, and death by suffocation—results. If rupture takes place into the left ventricle, the symptoms are more remote and obscure. Mortification of a part or limb from obstruction of a large artery by one of the secondary or tertiary cysts, is a likely result.

DISEASES OF THE ARTERIES.

OBLITERATION OF THE ARTERIES.

The arteries are liable to obliteration from any cause which for a time arrests the circulation through them. It appears that when their coats are inflamed the current of blood is retarded, and at last completely stagnant; coagulation then follows, the clot adheres to the walls of the contracted tube, and is at last converted into a fibrous cord. The most common cause of obliteration is a process termed by Virchow *embolism*, *i.e.*, the impaction of clots, fibrinous concretions, or atheromatous matter, in the remote arteries.

Symptoms.—Inflammatory obliteration is not necessarily attended by other than local symptoms, such as tenderness and hardness of the vessel. The process is usually slow enough to allow of the establishment of collateral circulations. If more than one of the main trunks were simultaneously affected, dry gangrene would result. Embolism occurring in the extremities, would also result in gangrene. If it occur in the internal carotids, softening of the brain, loss of vision, and hemiplegia may, one or all, result. If the pulmonary artery be blocked by a clot at its bifurcation, death, more or less sudden, from asphyxia, will be the consequence. If the smaller superficial arteries be the seat of the embolism, sloughing ulcers may ensue.

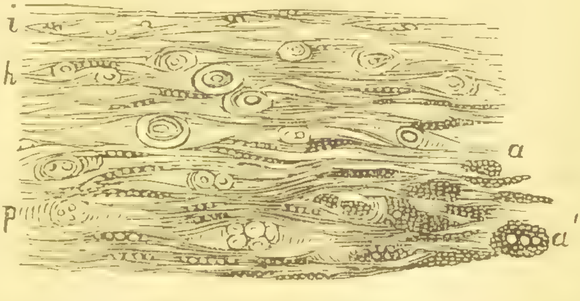
ATHEROMA.

This term comprises both fatty and calcareous degenerations of the blood-vessels, atheroma proper being an intermediate condition. After the age of fifty the walls of the vessels are very liable to degeneration. The aorta, in particular, becomes dilated, the elasticity of its wall impaired, and its inner surface roughened by large, irregular, whitish, elevated patches of morbid matter, composed of a mixture of earthy and fatty matter, and lying immediately beneath a superficial layer of the inner coat.

SYMPTOMS.—When the disease affects the smaller arteries, such as the radial and temporal, they become rigid and tortuous, and feel like cords. A dilated atheromatous condition of the aorta is indicated by a loud systolic bellows murmur, commencing at the mid-sternum, and extending thence towards the right shoulder, most distinct to the right of the sternum, and thus distinguished from murmurs due to disease of the aortic valves. Atheromatous disease of these valves is, however, very frequently associated with a similar degeneration of the contiguous part of the aorta. Owing to the diminished elasticity of the diseased artery, the pulse has the same sudden, jerking character as in regurgitant disease of the aortic valves. (See page 434).

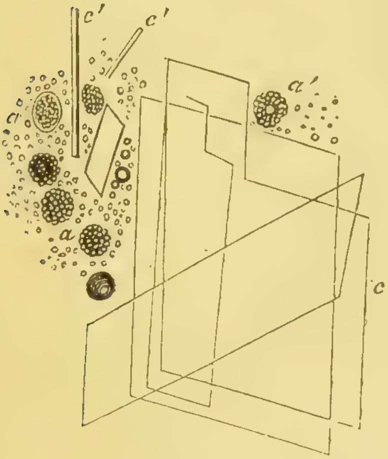
MORBID ANATOMY.—At first an opaque whitish spot is observed on the inner surface of the artery. It consists of a fatty degeneration of the tissues, immediately beneath the innermost layer. A vertical section presents the appearance shown in Fig. 55: *i* being the unaltered innermost layer; at *h* the corpuscles of connective tissues are enlarged; at *p* these cells are observed to be multiplying; at *a* the fatty degeneration in these cells is seen commencing; at *a′* they are in an advanced stage.

Fig. 55.



The next stage of the process consists in the deposit of molecules of earthy matter, and the separation of cholesterin. If we examine the disintegrated portion of the arterial wall at this stage, we observe large rhombic plates or prisms of cholesterin *c c c* (Fig. 56); and cells of the internal coat transformed into fatty-granule globules *a a*, imbedded in free granular matter, composed in part of earthy matter, and in part of free large and small drops of oil. (Virchow.) These accumulated deposits either form a pultaceous matter, which may be discharged into the blood through an aperture formed in the internal coat, leaving the so-called atheromatous ulcer; or they may, by the increase of the earthy particles, become petrified into irregular ossific plates. In the smaller arteries the ossification proceeds much more uniformly, and they become at last more or less completely converted into smooth bony tubes.

Fig. 56.



The capillaries are equally liable to degeneration. When their walls are invaded with fat, they present a granular appearance.

As a result of this condition their elasticity and contractility is impaired, they become permanently dilated, and the blood tends to become stagnant in them.

Effects.—*Proximate.* Rupture; atheromatous ulceration of the inner coat, with aneurismal dilatation of the outer; dilatation resulting first in congestion, and finally in rupture of the capillaries, especially those of the brain, causing sanguineous apoplexy.—*Remote.* Hypertrophy of the heart; embolism.

Causes.—The rheumatic and gouty diathesis.

Treatment.—The avoidance of hurry, exertion, and fatigue; animal diet; tonics in combination with alkalies.

ANEURISM OF THE AORTA.

1. ANEURISM OF THE THORACIC AORTA.

Symptoms.—The general symptoms produced by an aneurismal tumour in the chest are the same as those due to any other tumour of equal size and similar situation—*dyspnœa*, and more or less consolidation of the lung from pressure of the aneurismal tumour; a harsh, harassing cough, with little or no expectoration, from pressure on the bronchial tubes; *aphonia*, and paroxysmal constriction of the glottis, from tension of the recurrent laryngeal nerves; *dysphagia*, from pressure on the œsophagus; *obstruction to the venous circulation*, accompanied, in extreme cases, by dropsical effusions into the cellular membrane of the face, neck, chest, and upper extremities, from compression of the large venous trunks; *neuralgia of the back and paraplegia*, from pressure on the spine, from absorption of the vertebræ; defective nutrition, from pressure on the thoracic duct.

DIAGNOSIS.—Difficult, when the tumour occupies the origin of the aorta, or when, whatever its situation, it is of small size. When it involves the *arch of the aorta*, or its first branches, and especially when it has so far increased as to rise out of the chest, the diagnosis becomes comparatively easy. When, again, the tumour, by its gradual increase in size, causes the protrusion of the sternum or ribs, or leads to their absorption, its strong heaving impulse will make the diagnosis certain. A *whizzing* sound, or a bellows murmur, sometimes single, or double, is usually heard in the situation of the tumour; but these sounds are not always present, nor are they to be depended upon in the absence of other symptoms, since they may be produced by any tumour pressing upon the larger arteries. A peculiar thrilling sensation communicated to the hand, and a quick thrilling pulse, are occasionally present. When the tumour occupies the arch of the aorta, or the large vessels of the neck, or upper extremity, we may expect to find some marked inequality in the pulsations of the radial and carotid arteries. Sometimes there is an absence of the pulse at the wrist, of one or of both arms, and occasionally of one or both carotid arteries; and there are signs of disturbed circulation through the brain, such as giddiness, faintness, and indistinctness of vision. Hæmorrhage from the lungs or stomach will have additional value as a sign of aneurism in the ascertained absence of symptoms of pulmonary consumption and obstruction to the portal circulation; if the tumour be at all large, dulness and bronchophony in proportion to the compression of the lung will be observed. A sensation of throbbing in the chest, difficulty of deglutition, and, in the later stages, vomiting and spasmodic dyspnœa, complete the evidences of thoracic aneurism.

PROGNOSIS.— Unfavourable; but the disease progresses slowly.

TREATMENT.—Perfect repose of mind and body, a cool moderate diet, a free state of bowels, occasional cautious depletion when urgent symptoms require it; a belladonna plaster to the region of the heart, and digitalis in small and repeated doses to moderate the action of the heart. The dry harsh cough will require the use of sedatives, with expectorants, and anasarca must be treated by the remedies prescribed under that head.

2. ANEURISM OF THE ABDOMINAL AORTA.

SYMPTOMS.—These vary with the size and situation of the tumour, and the viscera upon which it presses. When the aneurism presses on the stomach, it gives rise to severe gastric disturbance; on the nerves of the solar plexus, to neuralgic pains; on the bowels, to obstinate constipation or violent colic; on the nerves issuing from the spine, to severe pain in the loins, abdominal parietes, or lower extremities, simulating rheumatism of those parts, sciatica, lumbar and psoas abscess, or disease of the spine. By pressure on the rectum, it has sometimes led to a suspicion of stricture of that part. When the tumour occupies the upper portion of the abdominal aorta, it may thrust up the diaphragm, and give rise to dyspnœa, and other symptoms of pulmonary disease.

DIAGNOSIS.—A tumour occupying the situation of the aorta, strongly pulsatile, and having the peculiar *thrill* above mentioned, accompanied by a short, harsh, bellows murmur. The pulsation is more uniformly diffused over an aneurismal tumour, than over any other lying upon the aorta; and the bellows sound is more harsh and grating than that occasioned by the pressure of such other tumours. It should be borne in mind that the pulsation of a healthy aorta may be communicated to a loaded intestine or other tumour seated over it.

The prognosis and treatment are those of aneurism of the thoracic aorta.

MORBID ANATOMY.—Laceration of the internal coats of the artery, and saccular dilatation of the external. Extravasation of blood between the layers of the artery, causing their dissection and dilatation. But the commonest cause of aneurism is fatty or atheromatous degeneration.

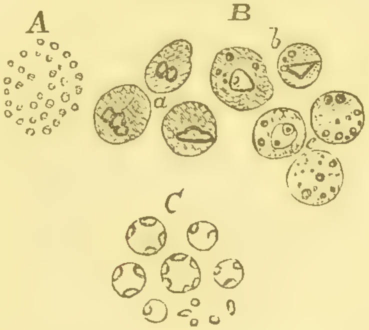
DISEASES OF THE VEINS.

PHLEBITIS . . . . Inflammation of the Veins.
PHLEGMASIA DOLENS . White Leg.

PRELIMINARY OBSERVATIONS.—*Thrombosis, Embolia, and Pyœmia.*—Before describing diseases of the veins it is necessary to say a few words on the formation of clots in the circulatory organs, to which process the term *thrombosis* has been given. When foreign matters are introduced into the vessels, the blood coagulates upon their surfaces. This is true of solid metallic bodies, such as iron; and of liquids, such as mercury and pus. Further, a clot of fibrine, or of blood formed within the blood-vessels, tends to increase by superposition of layer upon layer of coagulum. Thrombosis, therefore, may be caused by phlebitis, arteritis, and endocarditis, in consequence of solid inflammatory exsudations on the inner surface of the veins, arteries, or heart. A film forms on the roughened inflamed surface; and, subsequently, layer after layer is deposited until a clot or thrombus of considerable size is formed, which is attached by one extremity to the inflamed surface, while the other extremity may freely vibrate in the passing current of blood, or may reach to the other side of the vessel and obstruct the flow of blood from below.

The subsequent changes which these clots undergo give rise to some of the most interesting and important pathological processes. If they slowly deliquesce without undergoing further change, no bad effects result. If the entire thrombus, or a large fragment of it be detached, it may be carried from a large vein into the pulmonary artery, and produce instantaneous suffocation; thrombi from the left side of the heart may become impacted in a carotid or brachial artery; clots from the surface of the aorta may block up any of its branches: in either case sloughing ulceration of a part, or mortification of the whole limb, will most probably ensue. If the clot undergo gradual disintegration into fine particles, these will be arrested in the capillary circulation, giving rise to *capillary embolia*, resulting in softening or ulcerative degeneration of the contiguous part. But even greater evils may result from the presence of clots in the circulation. If we examine these thrombi, we frequently find their central parts occupied by a puriform mass, caused by transformation of the clots themselves. Under the microscope, this disintegrated matter is found to be composed of granules (A, fig. 57) derived from the disintegrated fibrin; corpuscles undistinguishable from pus corpuscles (B); and altered blood discs (C). Now, the question arises, what are these cells? Virchow says, "Colourless blood corpuscles set free by the softening;" others consider them to be true pus cells. We coincide entirely with the latter view, for—1. Evidence is wanting to prove that leucocytosis can take place to this extent in the blood itself. 2. From the effects of the metamorphosis above described, which we believe to be those of pyæmia. Whether the pus cells be derived externally from a suppurating wound, in the manner described under pyæmia at p. 334, or internally from purulent metamorphosis of the clot itself, the result is the same. Wherever they are carried, the pus cells form the nuclei of other clots, which, in process of time, become centres of suppurative inflammation; and thus abscesses may be simultaneously deposited in all parts of the body.

Fig. 57.



PHLEBITIS—INFLAMMATION OF THE VEINS.

Varieties.—Adhesive, and suppurative (pyæmia).

Pathology.—Idiopathic adhesive phlebitis commences in inflammation of the coat of the vein, causing its dilatation and such impairment or loss of contractility, that stagnation and subsequent coagulation of the blood is the interior result. The disease is strictly local at first, and if the coagulated blood be very gradually disintegrated or absorbed, it may remain so, and the vein may be ultimately restored to its original condition. If, however, portions of the coagula become detached, embolism may result. If they undergo purulent degeneration, the phenomena of suppurative phlebitis (pyæmia) appear.

SYMPTOMS.—When occurring in the superficial veins, swelling and induration, sometimes accompanied by redness, in the course of the vessels; pain increased by pressure; œdema of the cellular tissue, and enlargement of the veins below the seat of the disease. When the disease assumes the supurative form, then arise all the symptoms of pyæmia (see p. 334)—namely, rigors, followed by profuse sweats, offensive diarrhœa, great weakness, anxiety, and irritability; a very frequent, weak, and sometimes intermittent pulse; a dry, brown tongue; and a sallow skin. As the disease advances, the joints often become painful and tender, inflammation of the viscera, or their serous investments, show itself, and collections of pus, with little or no inflammation of surrounding textures, form in different parts of the body.

CAUSES.—*Predisposing.* Cachexia.—*Exciting.* In rare instances, cold; in most cases, inflammation spreading from surrounding tissues, or injury done to the veins themselves, as in bleeding, amputation, extraction of tumours, tying varicose veins, and operations for hæmorrhoids. Phlebitis is also apt to supervene on fractures, or on operations performed on bones; and it often originates in injuries to the veins of the internal viscera, as of the uterus after childbirth, and the umbilical cord of new-born children.

MORBID ANATOMY.—Discoloration of the inner coat of the vein; inflammation and thickening of the other coats; inflammation and suppuration of the surrounding textures; formation of coagula and pus within the vein; deposits of pus in the joints and serous cavities, or in the spleen, or kidneys; but more especially in the lungs and liver.

DIAGNOSIS.—From *inflammation of the absorbents*, by the absence of superficial redness and the larger size of the inflamed vessel, which feels like a large, hard, knotted cord, and is tender.

PROGNOSIS.—Favourable in inflammation of the external veins, arising spontaneously or from cold. Less favourable in phlebitis following wounds, or injury to the veins. Secondary abscesses in external parts may be regarded as favourable.

TREATMENT.—Leeches in the course of the inflamed vein. A position favourable to the return of blood to the heart. Warm fomentations. If the accompanying fever be great, aperients, or calomel and opium; if of the typhous character, wine, brandy, and diffusible stimulants, in combination with opium. In most cases the strength must be supported by bark or quinine, with a liberal allowance of wine or brandy. Close attention should be paid to uneasiness or pain in parts of the body remote from the seat of the disease, as indicating collections of pus requiring prompt relief by the knife.

PHLEGMASIA DOLENS—PHLEGMASIA ALBA—WHITE LEG.

DEFINITION.—Obstruction, usually of an inflammatory character, of the femoral vein, or of the femoral and iliac veins.

SYMPTOMS.—From one to five weeks after delivery, a painful elastic swelling of one or both legs, beginning generally in the groin, labia, and thigh, and thence extending downwards; characterised by great heat and tenderness, a pale, shining surface, and stiffness of the limb. It is commonly ushered in by rigors, with pains in the loins or belly; and is accompanied by fever, thirst, a quick and frequent pulse, headache, nausea, and a furred tongue.

CAUSES.—*Predisposing.* The puerperal state.—*Exciting.* Inflammation of the iliac and femoral veins, generally commencing in the veins of the uterus and viscera of the pelvis.

PATHOLOGY AND MORBID ANATOMY.—Those of adhesive phlebitis.

DIAGNOSIS.—From *œdema*, by the absence of pitting on pressure. From *common inflammation* by the pale, shining aspect of the surface.

PROGNOSIS.—Generally favourable, but recovery often tardy.

TREATMENT.—In acute cases, leeches to the most painful parts of the limb, followed by warm fomentations; opium in large doses, with calomel or blue pill, given so as to affect the mouth. The limb should be placed in the horizontal position or slightly raised; and the bowels should be kept free. If there be much fever, saline diaphoretics. In chronic cases, after the inflammation has subsided, iodide of potassium; infrictions of mercurial or iodine ointments.

CHAPTER III.

DISEASES OF THE ORGANS OF RESPIRATION.

1. Of the Larynx and Trachea.
2. Of the Bronchial-tubes and Air-cells.
3. Of the Substance of the Lungs.
4. Of the Pleura.

DISEASES OF THE LARYNX AND TRACHEA.

LARYNGITIS	Inflammation of the Larynx.
APHONIA	Loss of Voice.
TRACHEITIS	Croup.
LARYNGISMUS STRIDULUS .	Crowing Inspiration.

LARYNGITIS—INFLAMMATION OF THE LARYNX.

SYNONYM.—Cynanche laryngea.
VARIETIES.—1. Acute. 2. Chronic.

1. ACUTE LARYNGITIS.

SYMPTOMS.—The disease sets in with rigors, followed by pyrexia, and usually by some inflammation of the tonsils, a hoarse voice, a husky and convulsive cough, constant hawking of glutinous mucus, with pain and constriction in the larynx, generally increased by pressure. The respiration is difficult and sonorous. There is great pain in deglutition, and particles of food and liquid are apt to get into the imperfectly closed glottis, causing convulsive fits of coughing, and dyspnœa. The fauces are generally found red and swollen; and, if the tongue be pressed downwards and forwards, the epiglottis may be seen thickened, inflamed, and erect. There is inflammatory fever, with flushed face, hot skin, and full, hard pulse. These symptoms are followed by others of a more formidable character. The countenance becomes pale and anxious; the lips livid; the eyes suffused; the nostrils expanded; the pulse frequent, feeble, and irregular; the voice reduced to a whisper, or lost; the throat often œdematous. There is extreme restlessness, and urgent fear of suffocation. The patient is obliged to maintain the sitting posture, and if he fall asleep he soon awakes dreadfully agitated, gasping and struggling for breath. Delirium and coma ensue, and death takes place in from four to five days. But the patient may die suffocated at a much earlier period.

MORBID ANATOMY.—Injection and thickening of the lining membrane of the larynx, with œdema of the submucous tissue, and surrounding cellular membrane. The glottis and epiglottis red, swollen, and infiltrated with serum, or pus. In some cases œdema of the glottis is the only post-mortem appearance.

DIAGNOSIS.—From *spasmodic affections of the larynx*, by the presence of fever and local pain, and by the gradual progress of the disease; from *tracheitis*, by the absence of the peculiar stridulous voice, and of the croupy inspiration; and, as a general rule, by the great age of the patients.

PROGNOSIS.—Unfavourable if the dyspnœa be extreme, the face livid, the circulation languid, and the head affected. Decrease of dyspnœa, a free expectoration, an improved aspect of countenance, and greater ease in swallowing, are favourable signs.

CAUSES.—*Predisposing.* Previous attacks of quinsey, frequent and continued exertions of the voice.—*Exciting.* Exposure to wet and cold; extension of inflammation from the tonsils or salivary glands; swallowing scalding or corrosive liquids; inhaling acrid gases or hot air; extension of inflammation in erysipelas, scarlatina, small-pox, measles, and diphtheria.

TREATMENT.—I. The most prompt and active measures must be taken to reduce the inflammation and prevent effusion. Two to six leeches must be immediately applied over the part, followed by tartarized antimony, with calomel and antimony in full doses. A grain of calomel, with from an eighth to a sixth of a grain of tartarized antimony, and a third or half a grain of opium, may be given every one, two, or three hours, according to the urgency of the symptoms. The object of this treatment is to reduce inflammation by the tartar-emetic, to supersede inflammatory action by the mercury, and to soothe existing irritation by the opium.

II. If effusion have already taken place, blisters should be applied on either side of the larynx, and the mercury continued until constitutional effects are declared. The action may be facilitated by the inunction of mercurial ointment.

When laryngitis supervenes on other diseases, the treatment must be modified according to the disease that may be present, and the existing state of the system.

III. When, in spite of remedies, the dyspnœa increases rapidly, and there is urgent danger of suffocation, the operation of opening the trachea should be resorted to without loss of time.

Throughout the treatment the patient should be prevented from talking.

2. CHRONIC LARYNGITIS.

SYMPTOMS.—Hoarseness, sometimes increasing till the voice is reduced to a whisper, or quite lost; dry, husky cough; pain or soreness in the larynx, increased by lateral or backward pressure. The cough is brought on by any unusual exertion, or by cold air, and is accompanied, in the first stage, with scanty mucous expectoration; in more advanced cases, and when ulceration is present, the sputa are purulent, and mixed with streaks of blood; or sanious and fœtid. In confirmed cases, dyspnœa is always present, coming on generally in paroxysms, and leaving the patient nearly free in the intervals; but in the last stage of the disease, it is increased to orthopnœa, obliging the patient, during the fits, to sit up in bed. In the intervals of the fits the breathing has a peculiar hissing sound. The patient generally dies asphyxiated.

MORBID ANATOMY.—Inflammation and its consequences in the mucous and submucous textures of the larynx; enlargement of the mucous follicles; œdema; ulceration of the mucous membrane; ossification, or caries of the cartilages.

CAUSES.—Those of the acute form: the inhalation of air loaded with dust or irritating particles of matter; syphilis; the abuse of mercury; tubercle. Ulceration from the cause last named occurred in about a fourth of the cases of phthisis quoted by Louis.

DIAGNOSIS.—By the permanent change of voice, the cough, the hissing breathing, and the pain or tenderness in the larynx. Tubercular laryngitis may be distinguished from simple inflammation or relaxation by the coexistence of the symptoms and physical signs of phthisis; and syphilitic laryngitis by the coexistence of other secondary symptoms.

PROGNOSIS.—*Favourable.* The absence of signs of disease of the chest; the catarrhal or syphilitic varieties of the disease.—*Unfavourable.* Increasing difficulty of deglutition from the spasmodic cough caused by the passage of food into the air-tubes; orthopnœa.

TREATMENT.—I. The chronic inflammation of the larynx may b subdued by the repeated application of a few leeches to the upper par of the throat, and by the use of blisters, mustard-poultices, and iodine ointment. The part itself should be kept at rest by the avoidance o talking.

II. If the disease have a syphilitic origin, mercury should be given in small doses, so as to affect the mouth, or iodide of potassium, i five-grain doses.

III. The tone of the relaxed mucous membrane may be restored b the inhalation of steam holding some gentle stimulant in solution, a kreasote, camphor, turpentine, or one of the balsams; or by the stil stronger stimulants, nitrate of silver, and sulphate of copper, applie directly to the part, in a liquid or solid form. The preference shoul be given to a strong solution of nitrate of silver, applied by a small probang to the epiglottis and upper part of the larynx. Solid substances must be used in the form of an impalpable powder, and drawn into the larynx through a tube. Nitrate of bismuth; calomel with twelve times its weight of sugar; red precipitate, sulphate of zinc, or sulphate of copper, mixed with thirty-six times their weight of sugar; alum with twice its weight; and acetate of lead with seven times its weight—are remedies suitable for this purpose.

IV. The paroxysms of dyspnœa, or convulsive cough, may be relieved by narcotics and sedatives, such as opium, æther, camphor, belladonna, or stramonium, inhaled or given in the form of lozenge. When the patient cannot swallow, it may be necessary to feed him by the œsophageal tube and stomach-pump. Where the urgent symptoms cannot be otherwise relieved, tracheotomy must be performed.

V. The improvement of the general health may be effected by tonics, especially iron, and the mineral acids, nourishing and wholesome diet, bracing air, the cold or shower-bath, with strict attention to the functions of the stomach and bowels, and to the state of the secretions generally.

APHONIA—OTHER DISEASES OF THE LARYNX.

As every condition which impairs the function of the vocal cords produces a corresponding loss of voice, the causes of aphonia are very numerous; and for their correct diagnosis the use of the laryngoscope is indispensable. This instrument consists of two mirrors, one for the forehead (the *frontal*), the other for the mouth (the *laryngeal*). The following are the directions for using it:—In the absence of direct sunlight, which is always to be preferred to artificial light, seat the patient in a dark room, and place an argand gas burner, or moderator lamp, so far behind his right shoulder that the face is in the shade, the light being on a level with the eye of the operator seated in front of the patient. Cause the head of the patient to be thrown so far back that the light from the frontal mirror may shine brightly into the back of the mouth against the soft palate. The distance between the frontal mirror and the mouth of the patient which gives the brightest illumination is about a foot. If the patient cannot command the tongue so as to let it lie relaxed on the floor of the mouth, the tip, being covered with a handkerchief, should be seized between the thumb and finger, and drawn forwards.

The laryngeal mirror is now warmed (by passing it twice or thrice above the flame of the lamp), and introduced to the isthmus of the fauces just within the pharynx, so as to tuck up the uvula and soft palate above and behind it; at the same time avoiding contact with the tongue and back of the pharynx, otherwise expulsive action is excited. On depressing the handle of the mirror the back of the tongue, the epiglottis, and finally the vocal cords and parts bounding the aperture of the glottis, are brought into view (fig. 58). In some persons, and under favourable circumstances, the rings of the trachea, and the apertures of the right and left bronchi, may be seen as the patient takes a deep inspiration (fig. 59). The vocal cords appear as two ivory-like

Fig. 58.

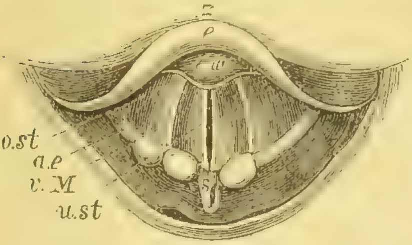
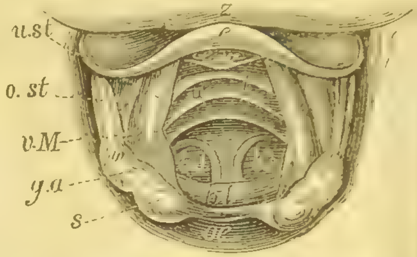


Fig. 59.



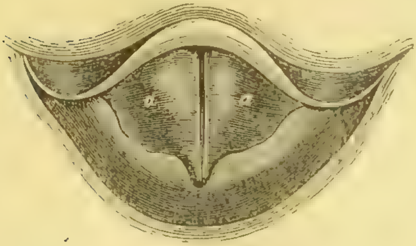
z, base of the tongue. *e*, epiglottis. *e w*, cushion of the epiglottis. *s*, cartilages of Santorini overlying the arytenoid cartilages. *w*, cartilage of Wrisberg lying in the fold of membrane which extends from the summit of the arytenoid, on either side, to the epiglottis. *g a*, tubercle which sometimes exists between the cartilage of Santorini and Wrisberg. *u st*, inferior, or true vocal cords. *o st*, superior, or false vocal cords. *v M*, the depressions between them, leading to the ventricles of the larynx. *a e*, aryteno-epiglottic ligament, lying in the aryteno-epiglottic folds of mucous membrane. *u l*, rings of trachea. *bd*, *bs*, right and left bronchus. (Czermak.)

rounded ridges, and if the patient be directed to ejaculate "ah!" they are seen to approximate closely, and then, during inspiration, to become widely divergent. The movements are vibratile, and very rapid.

When the fauces are very irritable, a few drops of chloroform may be inhaled. In some nervous subjects two or three sittings may be required before a view of the glottis can be obtained.

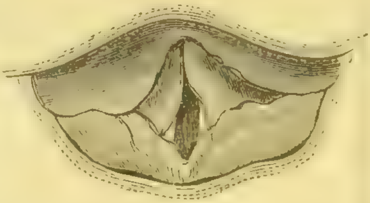
CAUSES OF APHONIA.—These may be functional or organic. 1. *Functional aphonia* is caused by paralysis or excessive debility of the muscles of the larynx, as in cerebral apoplexy, diphtheria, cholera. Hysteria is a common cause of aphonia, but in this disease there is not

Fig. 60.



Œdema of the glottis, the superior vocal cords *a a*, and the aryteno-epiglottidean folds much swollen, the former almost meeting over the true vocal cords.

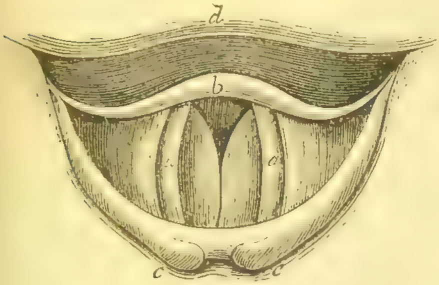
Fig. 61.



Partial loss of the epiglottis (syphilitic) and swelling of false vocal cords. Symptoms, hoarseness, passing into aphonia. (Czermak.)

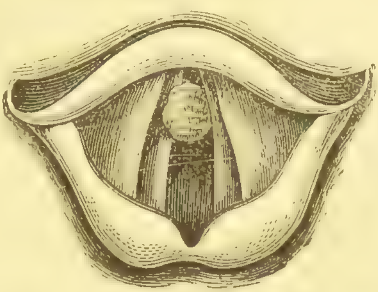
a loss but a suppression of voice, and the patient may talk in her sleep, or be induced to do so under the influence of electricity. Severe fright occasionally causes temporary loss of speech. In all cases of functional aphonia the vocal cords lie almost parallel, separated by a variable interval, and immoveable.

Fig. 62.



a a, the true vocal cords, below which are two sub-glottic swellings, meeting in the centre. *b*, epiglottis. *c c*, arytenoid cartilages. *d*, back of tongue. (Gibb.)

Fig. 63.

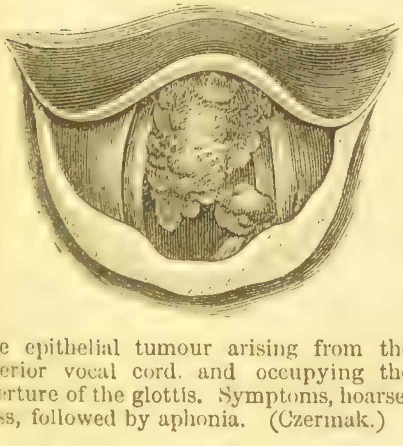


Polypus attached to the right vocal cord, the real cause of a supposed nervous aphonia. (Czermak.)

2. *Organic aphonia.*—The causes of organic aphonia are the following:—Laryngitis; œdema; chronic thickening; ulceration; tubercular deposits; cancerous, warty, or cystic tumours, of the vocal cords or arytenoid cartilages; abscesses or other tumours of the contiguous parts projecting between the vocal cords, or pressing on them. The margin of the glottis is a very favourite seat for warty excrescences.

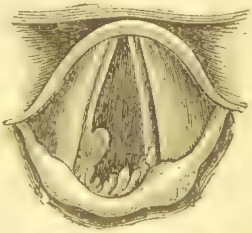
Treatment.—Functional aphonia generally, and especially that caused by paralysis, will be benefited by electricity. In debility the general treatment recommended under diphtheria will be required.

Fig. 64.



Large epithelial tumour arising from the interior vocal cord, and occupying the aperture of the glottis. Symptoms, hoarseness, followed by aphonia. (Czermak.)

Fig. 65.



Syphilitic excrescences on true vocal cords. (Condylomata of the larynx.) Symptoms, severe hoarseness. (Czermak.)

Strychnia in $\frac{1}{20}$ grain doses twice or thrice a day has proved serviceable in some cases. Astringent and stimulating gargles may be used simultaneously. Hysterical aphonia requires the treatment of hysteria. The treatment of organic aphonia will vary with its cause. If there be tubercular infiltration, we may apply a leech over the thyroid cartilage occasionally, or direct croton liniment to be rubbed in; the general treatment being that of phthisis. If there be follicular enlargement or ulceration, solution of nitrate of silver (gr. v in ʒj) may be applied within the lips of the glottis by means of a camel-hair brush fitted in a handle suitably curved. Granular enlargements and chronic ulcerations may be removed by the repeated application of solid nitrate of silver. Malignant disease may be kept in check by the same means. Small pedunculated tumours may be removed by Dr. Gibbs's laryngeal écraseur. Abscesses and œdema may be relieved by a suitably curved bistoury.

Acute œdema requires very prompt treatment. When practicable, the œdematous part may be freely pricked here and there with a curved and fine-pointed armed bistoury, so as to induce free bleeding. If this operation cannot safely be performed, strong solution of nitrate of silver may be applied to the larynx and a few leeches to the throat; and ♏xxx tincture of perchloride of iron may be given. If no relief be afforded, and suffocation impend, tracheotomy must be performed.

TRACHEITIS, OR CYNANCHE TRACHEALIS—THE CROUP.

Symptoms.—The disease generally begins with hoarseness, wheezing, and a dry short cough. Sometimes there is a rattling in the throat during sleep, and the child is often observed to raise the hand to the throat. After a time the breathing becomes difficult, the voice husky or absent, and the breath is drawn in with an audible sound, as if passing through a constricted orifice or narrow tube, and in speaking or coughing, it acquires a shrill and peculiar sound, similar to the crowing of a cock. The cough is dry; but at length a viscid matter is brought up, and flakes or tubes of false membrane, with efforts often so distressing as to threaten strangulation. The disease is accompanied by inflammatory fever, with hot skin and flushed face, and generally terminates fatally about the second or third day; the lips become blue, the pulse thready, and after much distress the patient becomes drowsy and comatose, and ultimately dies suffocated.

Anatomical Characters.—Inflammation of the lining membrane of the trachea, often extending to the larynx and bronchi, and the formation of a false membrane, which, in extreme cases, fills the trachea and bronchi. Large portions of this false membrane, casts of the tube, have been expelled during fits of coughing and vomiting.

Causes.—*Remote and Predisposing.* Age from three to fourteen; low and damp situations, inland, or on the sea-shore.—*Exciting.* The common causes of inflammation. The disease is sometimes epidemic, and some suppose it to be contagious.

DIAGNOSIS.—By the peculiar breathing, speaking, and coughing above described. From *laryngismus stridulus.*—See that disease.

PROGNOSIS.—*Favourable.* Early and free expectoration, the breathing not much impeded, the voice little changed, the febrile symptoms moderate.—*Unfavourable.* Great anxiety and difficulty of breathing, with shrill whistling inspiration ; livid face, and cold extremities.

TREATMENT.—*Indications.* I. To subdue inflammation. II. To obviate urgent symptoms.

I. The first indication is fulfilled by the free application of leeches to the larynx and trachea ; followed by a warm bath and tartar-emetic in nauseating doses. The treatment may be commenced by an emetic of from half a grain to a grain of tartar-emetic, according to the age. The bowels should also be freely opened.

Calomel should be combined with the tartar-emetic, and mercurial ointment should be rubbed into the thighs or arm-pits, so as rapidly to affect the system, and prevent the further effusion of lymph. Mercury may be used with the more freedom in children, as they are with difficulty affected by it.

II. If the symptoms are urgent, the false membranes may sometimes be brought up by the operation of an emetic. When partially discharged by coughing, they should be carefully removed by the hand. If suffocation threaten, tracheotomy must be performed. To be successful, it should be performed as early as possible; but it often fails through the extension of the inflammation to the lower part of the trachea, or even into the bronchial tubes.

LARYNGISMUS STRIDULUS—FALSE OR SPASMODIC CROUP.

SYNONYMS. — Crowing inspiration ; child-crowing ; spasmodic asthma of children ; thymic asthma.

SYMPTOMS.—The principal feature of the disease is a remarkable crowing inspiration, unattended by cough, coming on suddenly, and often on first waking from sleep. For a short time the child makes ineffectual efforts to inspire air, and struggles violently, but at length the difficulty is overcome, and the breath is drawn in with a loud crowing sound. If the impediment be less complete, the respiration is hurried and laborious, each inspiration being attended by the peculiar crowing sound ; the face becomes livid, the eyes staring and suffused, convulsions supervene, the thumbs are clenched in the hands, the fingers and toes are flexed, and the joints of the wrist and ankle forcibly bent. In extreme cases, death takes place by asphyxia, or the little patient falls, pale and exhausted, into the nurse's lap.

PATHOLOGY.—Irritation reflected through the inferior or recurrent laryngeal nerve on the muscles of the larynx, in consequence of irritation of the gums, stomach, or bowels. A diseased condition of the bronchial and cervical glands, producing irritation of the pneumogastric nerve, or its recurrent laryngeal branches.

CAUSES.—*Predisposing.* Infancy; from birth to the age of three years; the scrofulous diathesis.—*Exciting.* Teething; intestinal irritation; worms; enlargement of the glands of the neck and chest.

DIAGNOSIS.—From *croup*, by the sudden accession and departure of the fits; by the freedom of the breathing in the intervals; by the absence of febrile or catarrhal symptoms; and, except in rare cases during the fit, of cough.

PROGNOSIS.—The disease generally terminates favourably. Fatal cases are rare.

TREATMENT.—*During the fit.* The patient should be placed in a warm bath, the face being exposed to a current of fresh air, and cold water should be dashed over the face and chest. If suffocation be imminent tracheotomy must be performed.—*During the intervals.* The treatment must depend on the existing causes of irritation. If the disease continues when these are removed, change of air, a suitable diet, and attention to the state of the bowels, will generally effect a cure.

Spasmodic diseases of the larynx, with croupy respiration, and convulsive cough or loss of voice, are of frequent occurrence in females, and belong to the long list of anomalous hysteric affections. They must be treated in the same way as other hysterical symptoms.

DISEASES OF THE BRONCHIAL TUBES AND AIR-CELLS.

CATARRHUS	Catarrh.
CATARRHUS EPIDEMICUS	Influenza.
BRONCHITIS	Bronchitis.
ASTHMA	Asthma.
EMPHYSEMA	Emphysema.
PERTUSSIS	Whooping-cough.

CATARRHUS—CATARRH.

Acute catarrh, commonly called "a cold," is a febrile affection. complicated with inflammation of one or other of the mucous membranes. If confined to the mucous membrane of the eyes and nostrils. it is called *coryza*, or *a cold in the head;* if it extend to the bronchial tubes, it is termed *bronchitis*; if it attacks the mucous membrane of the bladder, it becomes a *catarrhus vesicæ.* Sometimes the inflammation affects the mucous membrane of the alimentary canal, and is attended with sickness and diarrhœa, or both, assuming the form of gastritis, enteritis, or gastro-enteritis mucosa. Its essential characters, therefore, are increased secretion of mucous from the nose, fauces, bronchi, intestinal canal or bladder, and pyrexia.

SYMPTOMS.—Slight rigors followed by pyrexia; weight and pain in the head; oppression of the chest, and impeded respiration; sense of fulness and obstruction in the nose; repeated sneezing; watery inflamed eyes; cold shiverings, succeeded by transient flushes of heat; soreness of the fauces and tonsils; herpetic eruptions on the lips; cough; pains about the chest; rheumatic pains in the back, neck, and head. After an interval of time, increased secretion of mucous from the affected mucous membrane. The chronic form of the disease is exemplified in common bronchitis.

DIAGNOSIS.—The absence of bronchial, pneumonic, and pleuritic symptoms.

CAUSES.—Cold, or wet and cold, applied to the body.

TREATMENT.—In most cases the best treatment of a cold is by ten grains of Dover's powder given over night, followed by a warm bath, or warm water to the feet, a basin of warm gruel, and a hot bed. By these means a profuse perspiration is excited, which effectually removes the febrile action. The Dover's powder may be followed up next morning by a saline aperient. A drachm of spiritus chloroformi may be substituted for Dover's powder. A large draught of cold water, taken at bed-time, will often effectually remove a common cold. If the fever run high, the best remedy is tartarized antimony in nauseating doses and at short intervals, with cooling drinks and saline purgatives.

If there be much smarting and running at the eyes, relief may be obtained by holding the head over the steam of hot water, or bathing the eyes repeatedly with warm water.

CATARRHUS EPIDEMICUS—INFLUENZA.

SYMPTOMS.—Those of a common cold in their most marked form, with sudden and extreme prostration, loss of energy, and depression of spirits. The febrile symptoms, which generally assume a remittent type, do not run high, nor is the pulse much increased in frequency. Sometimes the catarrhal symptoms are very slight, the disease being characterised by extreme debility without local symptoms.

TERMINATIONS AND COMPLICATIONS.—Pneumonia tonsillitis bronchitis and pleurisy are often intercurrent. Muscular and articular rheumatism; diarrhœa and dysentery; erysipelas; continued fever; occasional sequences.

CAUSES.—*Predisposing.* The male sex; adult and especially old age; a former attack; low, damp situations.—*Exciting.* A peculiar condition of the atmosphere.

Laws of the Epidemic.—The influenza has been epidemic in the years 1510 and 1557; in 1729, 1733, 1743, 1762, 1775, and 1782; in 1830, 1837, 1841, 1844, 1847, and 1851. It seems to have originated in the East, and after an uncertain period to have shown itself in the north of Europe, whence it has spread westward till it reached England; and from England has passed in a south-easterly direction to France, Spain, and Italy, and across the Atlantic to America. Its course is very similar to that of the Asiatic cholera, of which it has more than once proved the precursor. Australia has been visited in recent epidemics. The disease, in every epidemic, has attacked a very large proportion (estimated at three-fourths, four-fifths, and nine-tenths) of the population, as well as many of the domestic animals. The mortality occasioned by it is considerable. In a million inhabitants of the metropolis the registered deaths from influenza were 65 in 1844, 117 in 1841, 150 in 1851, 295 in 1848, and 572 in 1847. In a recent year the total deaths in the metropolis from this cause were 1253. Its latent period is believed to be from a few hours to two or three weeks. It commonly remains in the same district or country from a month to six weeks.

Diagnosis.—From *common catarrh*, by its greater prevalence, the suddenness of its attack, the extreme debility which attends and follows it, and by its occurring indifferently at all seasons of the year, and in all states of the atmosphere. From *ephemeral fever*, by the extreme prostration, and, in many cases, by the herpetic eruption on the lips.

In the epidemic of 1844–5, several cases of influenza assumed a well-marked remittent character, with exacerbations on alternate days, and the herpetic eruption on the lips. (G.)

Prognosis.—Rarely fatal to the young and robust, unless complicated with pneumonia; dangerous to the aged, to the feeble, and the intemperate, and to persons subject to asthma and consumption.

Treatment.—In mild cases, that of catarrh; in severe ones, and in aged persons, stimulants, combined with opiates (Form. 119, 238), with a nourishing diet, and liberal use of wine, and local treatment appropriate to the existing complication. In the treatment of local complications, the adynamic character which they assume in influenza must be borne in mind. Change of air is one of the best remedies as soon as the severe symptoms have passed away.

BRONCHITIS.

Varieties.—1. Acute. 2. Chronic. 3. Plastic (Bronchial Polypi).

1. ACUTE BRONCHITIS.

Symptoms.—Bronchitis often supervenes upon severe catarrh, the inflammatory affection of the mucous membranes spreading from the upper part of the respiratory tract into the lungs. The *general symptoms* are severe in proportion as the mucous inflammation extends towards the air lobules. The skin is hot and dry, the pulse full and rapid ; there is more or less urgent dyspnœa with wheezing inspiration, and a sense of great oppression referred to the epigastrium. The patient is exhausted by a dry wheezy cough, which often comes on in severe paroxysms; the head is hot and painful, the tongue coated, the urine scanty and high-coloured, and deposits lithates.

After a few days the cough becomes moister, and a clear viscid frothy mucus is expectorated. This gradually loses its adhesiveness and becomes thick and purulent; free expectoration now sets in, affording much relief, the fever and dyspnœa subside, and the cough alone remains. At first it is so frequent that little continuous sleep can be obtained; in a few days the expectoration begins to diminish, the cough subsides, and the patient convalesces. The mucous membrane, however, recovers but slowly, and it often remains in a congested, debilitated condition, and liable, on the least change of temperature, to renewed attacks of inflammation, which ultimately become chronic.

When the inflammation spreads into the vesicular structure, and becomes diffused through both lungs, the symptoms are very urgent, the dyspnœa extreme, the face dusky and anxious.

The *local signs* of the disease are highly characteristic. The sitting posture is chosen to allow of the free expansion of the chest, the arms and head are firmly fixed to give effect to the action of the extraordinary muscles of inspiration ; the chest is everywhere resonant ; on applying the ear, the air is heard, during inspiration, to traverse the bronchial tubes with a wheezing, wind-sighing, or whistling sound ; and, during expiration, to pass back again with a prolonged sonorous rhonchus. These sounds are loudest about the roots of the lungs, *i.e.*, about the middle parts of the chest in front and behind. At the bases, apices, and sides the vesicular murmur may still be heard, but feebler than usual, and here and there obscured by the coarser morbid sounds, or its place is supplied by crepitation. The rhonchus and sibulus are often so loud and general that the vesicular murmur is nowhere heard.

While the inflammation prevails, the elasticity of the lungs is more or less impaired, and in some severe cases the air is imprisoned in the distended lobules by the inflamed and constricted smaller tubes. In this condition the dyspnœa is extreme ; we hear dry, wheezing, and rhonchial sounds, but no vesicular murmur.

As soon as secretion begins moist sounds are heard. If the inflammation have involved the finer air tubes and the vesicular structure, a fine mucous crepitation is heard over the whole of the back and sides of the chest ; and in the larger tubes coarser crepitation or mucous râles, with more or less musical wheezing. During an attack of acute bronchitis, the ingress of air to an entire lobe of one of the lungs may be suddenly stopped. During a violent fit of coughing, the tenacious mucus brought together from the smaller tubes is drawn back into a large bronchus by the forcible inspiration which accompanies the convulsive cough, and becomes firmly impacted. The symptoms are sudden and extreme dyspnœa, or actual suffocation. No air is heard to enter that part of the lung to which the obstructed bronchial tube leads, but, since it is distended with imprisoned air, the corresponding part of the chest retains its natural resonance.

Acute bronchitis often occurs in children; its most severe and urgent form has received the name of suffocative catarrh, and is characterised by a sudden and copious secretion of mucus, extreme and urgent dyspnœa, and fine mucous crepitation in every part of the lungs.

2. CHRONIC BRONCHITIS.

SYMPTOMS.—This disease is the sequel of the acute form. In middle-aged or old persons it returns every winter with increased severity, and reappears for several years in succession; in which case it is called winter cough. When the mucous membrane secretes freely, and the breathing is very difficult, the disease is called humoral asthma. The symptoms of this disease are habitual cough, shortness of breath, and copious mucous expectoration. After repeated attacks of the disease, the pulmonary tissue becomes weakened, and emphysema results, marked by increased dyspnœa, and a peculiar dusky hue of countenance. The sufferings of the patient are often increased by flatulence.

In advanced age there are drowsiness, extreme and increasing debility, and coldness of the surface, and the patient is at length suffocated by the accumulated mucus, which he has no longer strength to expectorate.

Dilatation of the bronchial tubes frequently accompanies chronic bronchitis. The symptoms are broncorrhœa, dyspnœa, unusual resonance of the chest, with tracheal or even amphoric breathing. Gurgling and pectoriloquy may also be heard if the dilatation be considerable. The excessive expectoration leads to wasting of the body.

MORBID ANATOMY.—Swelling and redness of the tracheal and bronchial mucous membrane, observed most commonly at the termination of the trachea, and in the first divisions of the bronchi. The air-passages contain a large quantity of tenacious mucus, or muco-purulent fluid. Portions of the lungs are occasionally *collapsed.* Collapse may be diffuse or scattered. Diffused collapse may affect the whole lobe of a lung. When it is complete, the part has the colour and consistence of fœtal lung, containing little blood, and being pale. The scattered form of collapse affects only single lobules or small aggregations of lobules, and usually those situated in the anterior edges of the lungs. The collapsed lobules form little depressions like cicatrices, usually of a dark colour. Collapsed lung may be readily inflated, and is thus distinguished from consolidated lung. The mechanism of collapse is very simple. A plug of mucus is drawn by a forcible inspiration into a bronchial tube; the contraction of that portion of the lung to which the obstructed tube leads may dislodge the plug sufficiently to allow the passage of air in expiration; but on inspiration it is again drawn back. The plug thus acts as a valve, allowing of the egress, but preventing the ingress of air, until at last the obstructed lung is completely deprived of air. The chest being an air-tight cavity, collapse of one part of the lung must be complemented by dilatation (emphysema) of another, and thus one morbid condition generates another. *Emphysema* alone is the commonest result of long-standing bronchitis. *Dilatation of the bronchi* is another morbid condition often found in chronic bronchitis; the tubes may be uniformly enlarged for a distance, or they may present spindle-shaped, globular, or saccular dilatations here and there, and the dilated part of the tube may be very thin; but usually its walls are greatly hypertrophied. The dilatation is due to atrophy, or abscess of the lung-tissue in the neighbourhood of the larger bronchi, the dilatation being complementary.

3. PLASTIC BRONCHITIS (BRONCHIAL POLYPI).

SYMPTOMS.—Plastic bronchitis is known by the expectoration of branched fibrinous casts moulded in bronchial tubes of the third or fourth diameter. Sometimes the casts are hollow and shreddy, but more usually they are solid and compact. The disease is always associated with hæmoptysis. It recurs after variable intervals. The physical signs are dulness almost as complete as in pneumonia, and absence of breath as well as voice-sounds, in the affected portion of the lung, by which the disease is distinguished from pneumonia.

PATHOLOGY.—Croupy, fibrinous exsudations from the mucous membrane, the detachment of which occasionally leads to hæmorrhage and the formation of coagula, which may take the form of the tubes.

PROGNOSIS.—The disease is rarely fatal, but it is very obstinate.

DIAGNOSIS.—Bronchitis occupying the whole of both lungs, occurring in a young adult of either sex, and not speedily yielding to treatment, justifies a suspicion of miliary tubercles. Chronic bronchitis with broncorrhœa and dilatation of the bronchi may, at first sight, be mistaken for phthisis. The broncorrhœa accompanying dilated bronchi may cause emaciation, and give rise to tracheal breathing and pectoriloquy. But the history of the case, the nature of the expectoration, and the other physical signs, will furnish decisive evidence of the nature of the disease.

SEQUELÆ.—Emphysema, hypertrophy of the heart, and dropsy.

PROGNOSIS.—Generally favourable in the acute and chronic forms; guarded in bronchitis senilis.

CAUSES.—Exposure to cold, the rheumatic and gouty diatheses, heart and renal diseases. In children, measles and whooping-cough.

TREATMENT.—*Of acute bronchitis.* In very acute attacks, occurring in persons previously in strong health, general bleeding from the arm, followed by tartar-emetic in nauseating doses, may be necessary; blisters, mustard poultices, or turpentine stupes, may be applied to the chest. The general treatment of bronchitis consists in the exhibition of stimulating expectorants, such as a combination of ammonia, squill, and senega. Free sweating and diuresis should be induced by appropriate medicines. When the expectoration is freely established, we may give squill or ipecacuanha in combination with the mineral acids. If the circulation be feeble, we may give a moderate amount of gin or brandy. If hypnotics be required, we must use henbane in combination with opium. Opium alone must be given, carefully and rarely prescribed, in the early stages of the acute disease. The plastic form of bronchitis is not very amenable to treatment. In otherwise healthy persons it gradually subsides. ♏xx tincturæ ferri perchloridi, and the inhalation of the vapour of turpentine, are the remedies most likely to do good. As a prophylaxis, the patient should never remain in a heated atmosphere. In the bronchitis of children, emetics are very serviceable by promoting expectoration.

In the chronic form of bronchitis, the treatment must be nearly the same as in the milder form of the acute disease. Compound squill pill is an excellent remedy, and it may be combined with comp. ipecac. powder or the extract of conium. When there is a considerable collection of mucus in the air-tubes, with urgent dyspnœa, an emetic may be given early in the morning, or twice in the week, with the greatest advantage. The body should be kept warm, and the chest may be protected by a full-sized emplastrum picis. The balsams, gum resins, and oleo-resins, such as myrrh, benzoin, tolu, ammoniacum, galbanum, copaiba, and turpentine, often do much good.

In old age.—When the debility is extreme, the appropriate remedy is a combination of stimulants and narcotics (Form. 235, 239). A nourishing diet and a liberal allowance of wine are also required. When dropsical effusions supervene, diuretics and expectorants must be given in combination with stimulants. The body and extremities should be kept warm, and exposure to cold avoided. The rooms should be kept warm, and as nearly as possible of an uniform temperature night and day. On leaving the room during the winter, a respirator should be worn, or, what answers nearly as well, a folded handkerchief held before the mouth. In many cases, exposure to cold air gives temporary relief, but the symptoms return with renewed severity when the circulation is restored by the warmth of the room.

ASTHMA.

DEFINITION.—Paroxysms of dyspnœa, with intervals of freedom.

SPECIES.—1. Humoral asthma. 2. Congestive asthma. 3. Spasmodic asthma. 4. Hay asthma. 5. Hysteric asthma.

1. HUMORAL ASTHMA.—Bronchorrhœa, or bronchial flux.

SYMPTOMS.—The attack is usually preceded by a sense of fulness at the pit of the stomach, lassitude, depression of spirits, drowsiness, and pain in the head; followed, on the approach of evening, by a sense of tightness across the breast, and dyspnœa, which continues to increase for some length of time. Both inspiration and expiration are performed slowly, and with a loud wheezing noise, and there is a dry cough. The face is either turgid and livid, or pale and contracted. At length the difficulty of breathing becomes so great that the patient, threatened with suffocation, leaves his bed, paces up and down his room, stands in a stooping posture, or sits with the body bent forwards, the arms resting on the knees, the shoulders raised, the abdomen contracted, and all the muscles of respiration thrown into violent action; and still finding no relief, seeks at the open window a supply of cold air. These symptoms usually continue till the approach of morning, when a copious expectoration of a thin frothy mucus comes on, the breathing becomes less laborious and more full, the patient speaks and coughs with greater ease, and, feeling every way relieved, falls asleep. The dyspnœa and tightness of the chest, with evening exacerbations, remain for some days. The attack often comes on about midnight.

PHYSICAL SIGNS.—Sound on percussion generally good. Sonorous and sibilant rhonchi at the commencement of the attack, followed by the mucous râle and crepitation. Some wheezing and sibilus usually remain after the attack.

MORBID ANATOMY.—The mucous membrane is generally free from disease; but some affection of the heart, particularly of the right side, is not uncommon. Emphysema is common in this, as in the other forms of asthma.

CAUSES.—*Predisposing.* Hereditary peculiarity; lax habit of body; long-continued dyspepsia; gout.—*Exciting.* Sudden changes of temperature; disorders of the alimentary canal, especially flatulence; certain effluvia, as of hay or ipecacuanha.

DIAGNOSIS.—From other diseases affecting the respiration, by the distinct paroxysms with intervals of perfect freedom. From congestive and spasmodic asthma by the copious secretion which ends the fit.

PROGNOSIS.—Asthmatic patients often attain to an advanced age, and the prognosis is favourable when tendency to phthisis and organic disease of the heart are absent.

TREATMENT.—I. *Immediate.* An emetic at the onset of the attack, if the patient is strong enough to bear it. In vigorous persons full doses of tartar-emetic, of ipecacuanha, or of the lobelia inflata (♏xv to ʒj of the æthereal tincture) may be given with great advantage. In the weak, stimulants are required, such as strong coffee, ammonia, or æther. These may be combined with opium in moderate doses. Heat applied to the extremities, or to the entire surface, by means of the warm or vapour bath, is extremely serviceable at the onset of the attack. When the fit has already lasted some time, and the expectoration is abundant, it may be encouraged by inhalations of conium.

II. *Subsequent.*—The exciting causes must be carefully avoided, the general health improved, and the digestive organs carefully regulated. The bowels to be kept free, but hypercatharsis avoided; liquids should be taken in moderation; the diet should be plain, the meals light, and acescent fruits and such vegetables as occasion flatulence be avoided. The internal remedies will vary with the state of the system. Astringent tonics are serviceable in most cases.

I have found alum, combined with ginger, very serviceable in removing the distressing flatulence which often precedes and accompanies the fit. Ten grains of the one, with five grains of the other, and three or four grains of rhubarb, may be given three or four times a day. I have also more than once met with spinal tenderness in the cervical and dorsal regions, and have used tartar-emetic ointment with much benefit. (G.)

2. CONGESTIVE ASTHMA.—Dry Catarrh.

This, like the foregoing, comes on in paroxysms of severe dyspnœa, but differs from it in the scanty expectoration that attends the cough, and terminates the fit. The sputa are scanty, highly adhesive, filled with air-bubbles, and speckled with round black or grey spots, and, at the height of the fit, often tinged with blood. After a time they become more abundant and less tenacious, and the fit passes off with increased expectoration.

PHYSICAL SIGNS.—Those belonging to a swollen state of the mucous membrane of the air-tubes—viz., clear sound on percussion, indistinct respiratory murmur, with sibilant rhonchi, or a peculiar click, and, in limited portions of the chest, the mucous crepitation.

MORBID ANATOMY.—A deep red or violet colour of the mucous membrane of the air-tubes, with scanty mucous secretion.

CAUSES.—Those of humoral asthma. Valvular disease of the heart.

PROGNOSIS.—Generally favourable, except when of long standing, or complicated with other functional or organic diseases.

TREATMENT.—Nauseating expectorants, as tartar-emetic, squills, ipecacuanha, lobelia inflata, are indicated in this form of the disease, together with inhalations of steam, tar-vapour, ammonia, and conium. Dry cupping and counter-irritation to the chest may be practised with advantage. Smoking stramonium is sometimes found advantageous, as in spasmodic asthma. Strict attention must be paid to the digestive organs; the bowels must be kept free by aloetic purgatives, and the general health be carefully attended to.

3. SPASMODIC ASTHMA.—This term is applied to dyspnœa occurring in fits, unaccompanied by signs of congestion or inflammation of the bronchial tubes, and presumed to depend on spasm of the muscular fibres of the air-tubes.

SYMPTOMS.—Those of humoral asthma; but that the fit comes on more suddenly, and terminates without expectoration.

PHYSICAL SIGNS.—Sound on percussion less clear than usual, respiratory murmur very faint, and occasionally accompanied with slight wheezing or whistling. If the patient be desired to hold his breath for a few seconds, or to count till the air in the chest is exhausted, and then to inspire slowly and steadily, the air will be heard to enter as usual. The respiratory murmur soon becomes feeble again.

CAUSES.—*Predisposing.* The same as in other spasmodic diseases; hereditary peculiarity; hysteria.—*Exciting.* Attacks of dyspepsia; extreme flatulence; irritation of the upper part of the spinal cord; pressure of tumours on the pulmonary plexus or on the vagus.

PROGNOSIS.—Favourable in the absence of complications: dangerous when combined with other diseases of the lungs, or with those of the heart. It often causes pulmonary congestion, and hæmorrhage, and induces emphysema, and dilatation and hypertrophy of the heart.

TREATMENT.—I. When the fit has actually commenced, some relief may be afforded by counter-irritants to the chest, epigastrium, and extremities; by antispasmodics, as opium, æther, chloroform, belladonna, assafœtida, and valerian. Opium and æther in combination (tr. opii. ♏xx to ʒss, and æther ʒss to ʒi) is a useful remedy in the fit. When the patient is aware of the approach of a fit, he may sometimes ward it off by an emetic, or by smoking stramonium or tobacco. Dashing cold water over the face and body will often succeed in preventing a paroxysm. The ascertained causes of the fit must be carefully avoided.

II. The diet should be light, wholesome, and easy of digestion; and all substances which encourage flatulence should be avoided. The state of the bowels must be carefully attended to. For the improvement of the general health, the shower-bath, or cold sponging, followed by frictions of the chest every morning; and tonics. Where much flatulence is present, alum in combination with ginger may be given with advantage. If there be tenderness in any part of the spine, leeches may be applied, or the tartar-emetic ointment, or both.

When the spasm of the bronchial tubes is combined with congestion of the mucous membrane, or with increased secretion, depletion or counter-irritation must be employed with antispasmodic remedies.

4. HAY ASTHMA.—Hay Fever.

SYMPTOMS.—Those of humoral asthma, with the addition of marked symptoms of catarrh.

CAUSES.—*Predisposing.* Peculiarity of constitution.—*Exciting.* The odour of hay, or that of a stable. In some cases fine powder floating in the air, especially that of ipecacuanha.

TREATMENT.—That of humoral asthma during the paroxysm. In the interval, the careful avoidance of the exciting cause.

5. HYSTERIC ASTHMA.

SYMPTOMS.—This disease has its seat in the external muscles, and is closely allied to chorea and hysteria. It is characterised by extraordinary frequency of the respiration, with perfectly healthy sound of the chest and breathing; and a rapid pulse. Sometimes also it is a marked symptom of paralysis agitans, the muscles of respiration partaking of the agitation.

A remarkable case of spasmodic asthma in a female aged twenty-two, came under my notice several years ago. The fits, which were of variable duration, were characterised by extreme frequency of breathing, with comparatively little general disturbance of health. There was amenorrhœa, some tenderness of the upper part of the spine, and constipation. The disease was cured by purgatives carefully and perseveringly administered. No other remedy was applied. Hypercatharsis was invariably followed by a paroxysm. In a case of the same kind in which there were 140 respirations to 144 pulses. Much benefit was derived from cold affusion. (G.)

EMPHYSEMA.

SYMPTOMS.—Permanent shortness of breath, increased to extreme dyspnœa by occasional exciting causes, such as exercise, flatulence, or a common cold; and in extreme cases, by assuming the horizontal posture; with a dusky hue of countenance and cold extremities. Fits of orthopnœa, with a violent palpitation and blueness of the face and lips, come on suddenly in the night, obliging the patient to sit up, and to open the doors and windows of his room for air. The dyspnœa is attended by cough, with scanty expectoration, which varies in character, consisting in most cases of a thin mucus, mixed with small tenacious clots, and filled with air-bubbles. The expectoration is often increased by a supervening attack of bronchitis; and it becomes abundant towards the end of the fit. In cases of long-standing the general aspect of the body undergoes a change; the face becomes pale, and of a dusky hue, the body grows thin, and the legs and abdomen swell.

PHYSICAL SIGNS.—Peculiarly clear sound on percussion, extending lower than usual; indistinct respiratory murmur, and prolonged inspiratory and expiratory sounds; and, in some cases, a dry crepitation, with occasional loud clicking sound, or a friction sound, similar to that of a finger rubbed on a table. The respiratory movements are indistinct, and the respiration is abdominal. The impulse of the heart is best felt in the epigastrium; the natural præcordial dulness has disappeared. In marked cases, the chest bulges in all directions; but when the emphysema is confined to one lung, or to a part of one lung, it is irregularly enlarged. It is usually associated with bronchitis.

MORBID ANATOMY.—Distension of the lungs; the anterior margins almost meet and conceal the pericardium; the heart and diaphragm are depressed; usually there are extensive old adhesions between the pleuræ, and the cartilaginous ribs are ossified. The lungs are pale, dry, and bloodless, and have a soft woolly feel; their cells are enlarged; and the distended lobules are often ruptured and communicate with each other, forming little bladders which collapse on the lightest touch of the scalpel. These are usually found on the thin anterior margins of the lungs. Hypertrophy with dilatation of the right side of the heart. General venous congestion.

SEQUELÆ.—The permanently distended condition of the air-cells, opposing as it does the entrance of a proper quantity of blood into the lungs, ultimately produces hypertrophy of the right side of the heart. Fatty degeneration of the liver and kidneys. Anasarca and ascites.

DIAGNOSIS.—From asthma, by the permanent shortness of breath. But as emphysema is common in chronic bronchitis, and supervenes after repeated attacks of all the forms of asthma, this diagnostic mark can rarely be applied.

CAUSES.—Repeated attacks of bronchitis, impairing the contractility and elasticity of the air-cells. Pleuritic adhesions, preventing the contraction of the lungs. Old age, leading to degeneracy of the lung-tissue.

PROGNOSIS.—The disease is rarely fatal in itself, but ultimately leads to dropsy.

TREATMENT.—I. *During the paroxysms.*—The fits may be greatly relieved by opium and diffusible stimulants. From ♏ xx to ʒss of laudanum, with from half a drachm to a drachm of æther, may be administered at the onset. The shoulders should be well raised, the doors and windows thrown open, and the body, especially the lower extremities, kept warm. In extreme cases, cupping between the shoulders, or the cautious abstraction of blood from the arm by a small orifice, may be necessary. When the patient has reason to expect an attack, an emetic, by emptying the stomach, and removing flatulence, may prevent the paroxysms; and similar relief is sometimes afforded by the free action of a calomel and colocynth pill, followed by a black draught.

II. *During the intervals.*—This disease does not admit of cure. The treatment consists in attending to the complications which may exist with it, and in a few simple precautions, such as the avoidance of colds by warm clothing and dry feet, the daily use of cold sponging or the shower-bath, regular and moderate meals, and aloetic aperients. If flatulence exist (Form. 282), food easy of digestion, and liquids in small quantity taken daily an hour before dinner.

Emphysematous patients suffer most in close, moist weather, when the function of the skin is impeded; and least when the weather is open and the air dry and bracing.

PERTUSSIS—WHOOPING-COUGH.

SYNONYMS.—Tussis convulsiva, chin-cough, kinkhost.

DEFINITION.—A contagious and infectious malady, characterised by a peculiar cough occurring in fits terminated by vomiting.

SYMPTOMS.—The disease generally begins as a common cold, and it is not till after two or three weeks, or, in rare cases, as many months, when the febrile symptoms have somewhat abated, that the characteristic symptoms show themselves. The cough now comes on in distinct fits, consisting in a series of violent and convulsive expirations with congestion of the face, and threatening of instant suffocation, and sometimes with involuntary discharge of the urine and fæces, followed by a sudden long-drawn inspiration, accompanied by a peculiar whoop which gives the disease its name. The convulsive coughing is renewed, and continues as before, till a quantity of mucus, thrown up from the lungs, issues from the mouth and nostrils, perhaps mixed with blood; or till the contents of the stomach are discharged by vomiting. After the fit the patient has an interval of perfect freedom from cough, and often expresses a desire for food; but when the attack has been severe, it is succeeded by much fatigue, hurried respiration, and general languor and debility. Children evince great fear of the fits, and will run to their nurses or mothers for relief. Adults are seized very suddenly, and the paroxysms are usually very severe. The disease generally attains its greatest severity at the end of the fourth or fifth week, after which the paroxysms become less severe, and at length, after a further variable period of from two weeks to four months, entirely cease. In some instances, however, the disease is protracted for several months, and even for more than a year.

SEQUELÆ AND COMPLICATIONS.—Bronchitis, with collapse of the lung: Pneumonia: Pleuritis: Gastritis: Phrenitis: Convulsions: Apoplexy: Epilepsy.

MORBID ANATOMY.—Inflammation of the bronchial tubes, with large collection of mucus in the air-passages. Collapsed spots, diffused or scattered, with complementary emphysema. Pneumonia. Inflamed bronchial glands. Inflammation of the mucous membrane of the stomach, and intestines, with enlargement of Peyer's and Brunner's glands. In other words, an inflamed condition of the parts supplied by the eighth pair of nerves, which have themselves been observed to be red.

CAUSES.—*Predisposing.* Childhood. Adults, however, are not exempt; and the disease may attack persons of seventy and eighty years of age. The seasons of spring and autumn.—*Exciting.* A specific poison acting on the eighth pair of nerves.

DIAGNOSIS.—In the early stage by the abundant sputa, the occasional vomiting, the violence of the paroxysms, and the perfect freedom in the intervals. When fully established, the convulsive cough and peculiar whoop above described.

PROGNOSIS.—*Favourable.* In proportion as the fits and bronchial inflammation are mild.—*Unfavourable.* A severe form of the disease in children under two years of age, and especially while suckling or teething; and in children born of phthisical or asthmatic parents. Complication with diffuse bronchitis.

Laws of Infection.—Rarely attacks the same person twice. May coexist with small-pox, measles, and other febrile disorders; but is sometimes cured on their appearance. Latent period, five or six days.

Mortality.—The deaths in London during 15 years, in a million persons of all ages, fluctuated between 582 and 1217; average, 857. Two diseases only (Typhus Fever and Scarlatina) are more fatal to life.

Treatment.—1. In the early stage tartarated antimony in doses sufficiently large to produce nausea. From a twelfth to a sixth of a grain, according to the age of the patient, may be given at short intervals, either alone, or in combination with a grain of hydrargyrum c̄ cretâ. Occasional gentle aperients, a bland farinaceous diet, and the patient must be carefully guarded from cold, and kept in a pure warm air. When there is extreme restlessness, and great distress in the fits, the tartar-emetics may be combined with opium. Half an ounce of antimonial wine with a drachm of laudanum, and distilled water in sufficient quantity to make a mixture of ℥iss, is a very good combination. The dose, for a child of ten years old, may be a tea-spoonful twice or thrice daily. When the mucus is brought up with difficulty, an emetic should be given once, twice, or thrice a week. A warm bath should be given occasionally.

2. If there be signs of inflammation in the lungs, a few leeches may be applied over the upper part of the sternum, followed, if necessary, by bread and mustard poultices, stimulating embrocations, or even blisters to the chest. If there be determination of blood to the head, leeches to the temples and cold applications. If the child be too weak to bear antimony, give ipecacuanha or squills in combination with spirit of chloroform and belladonna. Expectorants combined with mineral acids often do much good. When the severity of the disease has passed away, change of air is the best restorative; and it is sometimes of the greatest service in the height of the disorder. Debility must be treated by tonics, especially the preparations of steel.

Remedies.—*Sedatives*, tincture or extract of hyoscyamus, or conium; syrup of poppies; extract of lettuce; prussic acid; belladonna; digitalis.—*Antispasmodics*, musk, garlic, assafœtida, and camphor; cochineal, oil of amber, cantharides, cinchona bark.—*Alteratives*, arsenic sulphate of zinc, alum, bromide of potassium. To most of these remedies the following observations of Dr. Bateman may be applied:—"Perhaps there is no disease for which so many *specifics* and infallible nostrums are promulgated with confidence, or so few actual remedies known."

DISEASES OF THE SUBSTANCES OF THE LUNGS.

PNEUMONIA	Inflammation of the Lungs.
GANGRÆNA PULMONUM .	Gangrene of the Lungs.
HÆMOPTYSIS	Spitting of Blood.
PHTHISIS PULMONALIS .	Pulmonary Consumption.

PNEUMONIA—INFLAMMATION OF THE SUBSTANCE OF THE LUNGS.

SYNONYMS.—Peripneumonia. Pulmonitis. Pneumonitis.

SYMPTOMS.—*General.* The disease sometimes sets in with rigors, followed by pyrexia; at others the local symptoms are the first to show themselves. There is high fever, with increased heat of surface, especially on the chest; flushed face; injection of the eyes; headache; frequent, quick, and compressible pulse; thirst, furred tongue; anorexia; and great debility. The symptoms referable to the chest itself are a diffused, dull pain, deep-seated, rarely acute, unless the disease involve the pleura; a short, dry cough, at first with scanty mucous expectoration, but after the lapse of one or two days, with a rusty-coloured, very adhesive sputum; the respiration is frequent and short, rising from 18 to 30 and upwards.

In favourable cases, the disease may decline on the third or fourth day; more frequently it is protracted to ten days or a fortnight. In unfavourable cases the symptoms increase on the third or fourth day; the respiration becomes more and more frequent; the sputa of a deeper hue, more viscid, and often streaked with blood; the pulse increases in frequency and feebleness; the tongue is dry and covered with a brown fur; the skin hot and pungent to the touch; the debility extreme; delirium and coma come on, with all the symptoms of the typhous state. In the last stage, the expectoration ceases to be viscid, and becomes a thin reddish-brown fluid; the dyspnœa increases; the pulse is small and fluttering; the face pale; the lips livid; the skin covered with a clammy sweat; there is an increasing rattle in the throat; and at length the patient dies exhausted, asphyxiated, or comatose. Fœtid odour of the breath, and putrid sanious expectoration, announce the occurrence of gangrene. In favourable cases the symptoms gradually subside, and the sputa become less viscid and more abundant and of a purulent or muco-purulent character.

Local Symptoms.—Dulness over the inflamed lung, unless it lie far from the surface; very fine crepitation; bronchial breathing and bronchophony, with increased respiration in the unaffected portions. Fine crepitation is the first indication of the congestive stage. It supersedes the vesicular murmur; continues to be heard for a day or so, and then gradually decreases till it is inaudible; and it is now that the bronchial breathing and bronchophony are most marked. If the inflammation subsides, a little mucous crepitation begins to be heard, and soon increases in intensity and extent, until at last it becomes general, the bronchial breathing and bronchophony meanwhile decreasing, and at last becoming extinct. The inflamed lung is again permeated by air, and the expectoration of viscid, rusty-coloured sputum is re-established. As the inflammation subsides, the moist sounds give place to the natural vesicular murmur, which, in returning, declares that the lung is being restored to its normal condition. Resonance on percussion is of course established *pari passu* with the recovery of the lung. If, however, resolution do not take place, the dulness, tracheal breathing, and bronchophony become very marked and persistent, and there is complete absence of vocal fremitis. But if the whole of one lung become consolidated, tracheal breathing and bronchophony are absent, because no air can be drawn into it. If portions of the hepatized lung suppurate, and the abscess be discharged, the physical signs of a cavity, viz., pectoriloquy, amphoric breathing, and gurgling (see Phthisis) will be present. The parts most commonly affected are the lower lobes of one or both lungs; and the local symptoms are most marked at the sides and back of the chest.

VARIETIES AND COMPLICATIONS.—Pneumonia is a frequent concomitant of the latter stages of infectious fevers, of erysipelas, and pyæmia; but is very liable to be overlooked. Great heat of the chest, unusual dyspnœa, and sudden aggravation of the symptoms, should lead us to suspect this complication. The physical signs are the same as in idiopathic pneumonia. It often comes on during the deposition of miliary tubercle in the lung, constituting *tubercular pneumonia*. It attacks patients in the advanced stages of phthisis; and is a frequent concomitant of bronchitis. Its most common combination is with pleurisy (pleuro-pneumonia).

MORBID ANATOMY.—In the first stage, *sanguineous congestion*. The lungs are gorged with blood, but still float in water. In the second, they are in a state of *red hepatisation*, and sink in water. Examined with a pocket lens, the broken surface of the solidified lung has a fine granular appearance. The third stage is that of *yellow hepatisation* or *diffused suppuration*. The lung tissue is soft and rotten, and a depression made with the finger soon fills with purulent fluid.

CAUSES.—*Remote and predisposing*. Sanguineous temperament, vigorous and plethoric habit, winter and spring seasons, a peculiar state of the atmosphere. Great debility and privation in the poor of large towns.—*Exciting*. The common causes of inflammation; vicissitudes of temperature, violent exercise of the body; congestion occurring from common causes, or in the course of various febrile diseases; tubercular deposits; heart disease.

DIAGNOSIS.—The adhesive, rusty-coloured sputa, the minute crepitation, the short, quick, silent breathing, and the physical signs just described, pneumonia. The history of the case distinguishes idiopathic pneumonia from typhus fever with chest complication.

PROGNOSIS.—*Favourable*. An early and copious mucous expectoration, the small crepitation changing to distinct mucous râle; later in the disease, an abundant muco-purulent expectoration, with return of resonance and respiratory murmur; hæmorrhage from the nose; warm, equable, and free diaphoresis; diarrhœa; inflammation on an external part; a sediment in the urine; diminished frequency of respiration (an extremely favourable symptom); the absence of complication; the disease of limited extent.—*Unfavourable.* Violent fever with delirium, or typhous symptoms; no expectoration, or the expectorated matter tinged with blood of a dark colour or black; sudden cessation of pain, followed by change of countenance, and a sinking or irregularity of the pulse; increasing frequency of respiration; a previously broken constitution; the disease extending to the whole lung or to both lungs; occurring in very young children, in the weak, or the aged.

TREATMENT.—Will vary with the stage of the disease. *During the first or congestive stage,* and in plethoric and vigorous subjects, blood may be taken from the arm, the bleeding to be followed by a brisk aperient, and by tartarized antimony, in half-grain doses, at intervals of one or two hours. The quantity may be increased to a grain, or even more, and it may be advantageously combined with calomel. Half a grain of tartar-emetic, with two of calomel, may be given every one or two hours, and mercurial ointment should meanwhile be rubbed into the arm-pits and groins until the gums are affected. This treatment, proportioned to the age, may also be employed in the pneumonia of infants. In less vigorous subjects, local depletion by leeches or cupping will suffice, and in weakly persons, counter-irritants, without abstraction of blood. As a general rule, bleeding is contra-indicated in the inhabitants of large towns, and still more in persons addicted to intemperance, who require a stimulant plan of treatment from the first. (A table-spoonful of the liq. ammoniæ acetatis every three or four hours.)

In the second stage, or that of hepatisation, blisters will be required, and calomel and opium should be given frequently, so as to affect the gums. If, however, there be high fever, tartar-emetic may still be continued in combination with the calomel; but if typhous symptoms have already supervened, stimulants, such as ammonia and brandy, are called for.

In the third stage, or that of suppuration or gangrene, stimulants such as ammonia, æther, and wine, must be freely given. Quinine and the mineral acids are the appropriate remedies for this condition.

The foregoing remedies must be employed, with due regard to the severity of the local disease, as well as of the general symptoms. When bleeding is employed, its effects should be carefully watched. Debility, in the absence of marked typhous symptoms, does not contra-indicate it; and if the pulse rise under its use, it may be repeated. The diet must be fluid or pultaceous, and nourishing, but not stimulating. The patient's room should be of a moderate and equable temperature (about 60°); the head should be raised as much as the patient's strength will allow, and the posture changed from time to time.

In chronic pneumonia following the acute form, a course of mercury so as slightly to affect the system, counter-irritation, the iodide of potassium with decoction of bark, with change of air, regular exercise, and temperate diet, may be resorted to. The patient must be closely watched, and the chest examined from time to time.

GANGRÆNA PULMONUM—GANGRENE OF THE LUNGS.

SYMPTOMS.—Extreme prostration of strength; a frequent, feeble pulse; expectoration of dingy-green sputa, mixed with blood, and of a peculiarly offensive odour; mucous râles and gurgling; marked typhous symptoms; and death from exhaustion.

CAUSES.—Pneumonia occurring in extremely feeble constitutions. Pulmonary apoplexy occasioned by pressure on the pulmonary veins.

DIAGNOSIS.—The pre-existence of inflammation, and the peculiar colour and offensive odour of the sputa.

PROGNOSIS.—Highly unfavourable, especially when the disease involves a large portion of the lungs. About an eighth of the cases terminate favourably.

TREATMENT.—Strong stimulants and opium in full doses. (℞ Ammon. carb. gr. x; Tinct. Opii ♏ xx to xxx.) The effect of the opium must be carefully watched. A liberal allowance of wine or spirits, and a nutritious diet. The chlorine gargle and mixture as recommended in Scarlatina. Inhalations of tar-water.

HÆMOPTYSIS—SPITTING OF BLOOD.

SYMPTOMS.—*General.* Spitting of blood is often preceded by a sense of weight and oppression in the chest, or of uneasiness in some one spot, with slight febrile symptoms, a frequent, sharp, and compressible pulse, some difficulty in breathing, and a dry tickling cough. In some cases the mouth constantly fills with blood, without cough or irritation of the throat; but in other cases the blood is brought up alone, or mixed with mucus, after long fits of coughing. The patient usually complains of a salt taste in the mouth.

Local.—In some cases the chest affords the natural sound on percussion, and there is slight mucous râle; in others there is dulness on percussion over a limited spot, surrounded by fine crepitation. In the first class, the hæmorrhage is from the bronchial tubes (bronchial hæmorrhage); in the second, blood is effused into the substance of the lungs (pulmonary apoplexy). In a third class of cases the spitting of blood occurs as a symptom of confirmed phthisis with the stethoscopic signs of a cavity.

CAUSES.—*Predisposing.* A certain age—from the period of puberty to the forty-fifth year; sanguineous temperament; plethora; narrow conformation of the chest; previous attacks of the same disease.—*Exciting.* Excessive heat; violent exercise; the lifting of heavy weights; inordinate exertion of the organs of respiration, as in public speaking, singing, &c.; external violence.

The most common cause of hæmoptysis is the existence of tubercular deposit in the lungs, the hæmoptysis in some cases preceding, in others following, the deposit. The next in point of frequency is vicarious hæmoptysis, the consequence of amenorrhœa. Less frequent still is hæmoptysis dependent on disease of the heart, or rupture of an aneurism. Least frequent of all is hæmorrhage, caused by plastic bronchitis. Hæmoptysis may occur in congestion of the lungs, however produced, as in pneumonia; in the fit of congestive asthma; and with hæmorrhage from other organs, in purpura hæmorrhagica, and purpura nautica.

DIAGNOSIS.—The blood is brought up by coughing, in small quantities, or mouthfuls at a time, of a florid red colour, and preceded by, or mixed with, a little frothy mucus. An abundant discharge of *florid* blood leads direct to the inference that the hæmorrhage comes from the lungs, in consequence of the rupture of an artery communicating with the air-passages.

From *hæmatemesis.*—The blood thrown up in hæmatemesis is usually in much larger quantity, of a darker colour, more grumous, mixed with food, and usually unattended with cough. From *hæmorrhage from the nose, fauces,* or *gums.*—By the negative result of a careful examination of those parts, and the history of the case.

PROGNOSIS.—The prognosis is generally favourable, when the hæmorrhage is not sudden and abundant; when it takes the place of the menses in amenorrhœa; or, in most other cases, in both sexes, its occurrence justifies a suspicion of the existence of tubercles: and in their ascertained absence of disease of the heart, is preceded or followed by the expectoration of solid exsudations from the bronchial tubes.

TREATMENT.—*Indications.* I. To remove congestion. II. To keep the circulation quiet. III. To contract the relaxed vessels.

I. The first indication is best fulfilled by bleeding from the arm. The circumstances which justify the adoption of this remedy are plethora, a full, frequent, and jerking pulse, great dyspnœa, a flushed countenance, and abundant hæmorrhage. When the countenance and skin are pale, the pulse small and weak, and the respiration little affected, bleeding is not required. Bleeding is also contra-indicated in phthisical hæmoptysis. Cupping may be substituted for general bleeding when the larger abstraction of blood is unnecessary.

II. Low diet, perfect repose, fresh cool air, cold liquids, or ice held in the mouth, with gentle aperients, fulfil the second indication. The head of the patient should be raised, and he should avoid talking. If after bleeding there be still some febrile action, tartar-emetic, in doses of one-eighth to one-fourth of a grain, every three or four hours.

III. After congestion or febrile symptoms have been removed, or in cases where there has been from the first no congestion or fever, the third indication will be fulfilled by remedies belonging to the class of astringents. (Form. 163, 175.) Digitalis, veratrum viride, and gallic acid are serviceable remedies. (Form. 173, 212, 213.)

PHTHISIS PULMONALIS—PULMONARY CONSUMPTION.

DEFINITION.—Tubercular deposit in the lungs, giving rise, sooner or later, to suppuration and hectic fever.

SYMPTOMS.—*General.* The disease usually begins with a short dry cough, on first rising in the morning, and so slight as to become habitual before it excites attention. It is sometimes accompanied by slight dyspnœa, increased on exertion, and the patient generally loses flesh, is soon fatigued, and easily thrown into a perspiration; or he complains of unusual chilliness. Slight dyspepsia, diarrhœa, frontal headache, and a small, frequent, quick pulse, are also among the early symptoms; and, on inquiry, we often learn that the patient formerly spat blood.

These early symptoms are often disregarded, or misinterpreted; so that the disease appears to begin suddenly with profuse hæmorrhage from the lungs, with pneumonia, or with bronchitis.

When the disease sets in in either of these ways, it sometimes destroys life in three or four weeks (*Acute Phthisis*). But in the great majority of cases it is chronic; and after the symptoms above described have continued for several weeks, months, or even years, in consequence of a cold, or some trivial exciting cause, the cough becomes more constant and troublesome, and is attended by expectoration, at first of a frothy mucus, afterwards of a more viscid and opaque sputum, often mixed with small round particles of tubercular matter, with pus, or with streaks of blood; or well marked hæmoptysis occurs. The dyspnœa increases, there are shooting pains in the chest, or cutaneous tenderness, and in many cases a peculiar hoarseness of the voice.

As the disease advances, the cough and dyspnœa become more urgent, the expectoration more abundant, the emaciation and weakness more considerable, the pulse more frequent; there are chills at noon or in the afternoon: the face flushes towards evening; the palms of the hands and the soles of the feet are burning hot; in a word, hectic fever sets in, followed towards morning by profuse perspiration. The urine is high-coloured, and deposits a pink sediment. The tongue, from being white, is now preternaturally clean and red, and the appetite often improves. Profuse diarrhœa, sometimes tinged with blood, colliquative sweats, extreme emaciation, shedding of the hair, œdema of the legs, aphthæ in the mouth and throat, hectic fever in its most marked form, and a very feeble, rapid, and often irregular pulse, usher in the fatal termination. In some cases the patient dies suffocated, having escaped many of the most distressing symptoms. In other instances delirium, and other indications of tubercular meningitis, precede the fatal event by some weeks. The appetite and spirits often remain good to the last; and the patient flatters himself with the hopes of speedy recovery, and is forming distant projects of interest or amusement, when death puts a period to his existence.

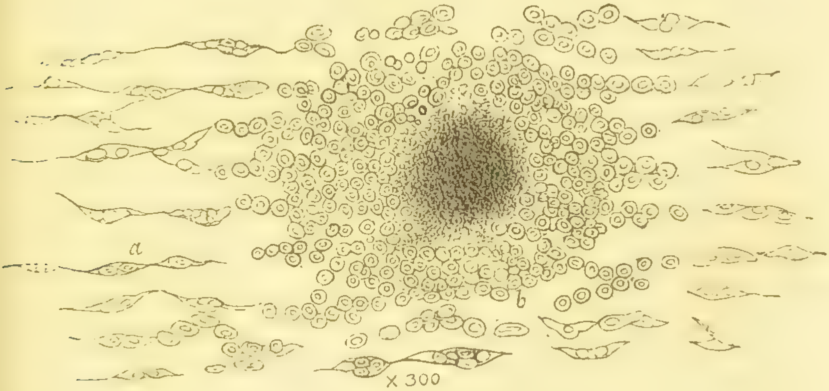
Local Symptoms.—In the incipient stage, before suppuration sets in, dulness on percussion over the clavicles and in the supra and infra clavicular regions, but generally greater on the right than on the left side. Similar dulness between the scapulæ. The upper part of the chest, in some instances, is obviously contracted, the clavicles being very prominent, the supra-clavicular regions deeply hollowed, the anterior and upper part of the chest flattened, and the shoulders thrust forward. The respiratory movements are diminished. The stethoscopic indications are a roughness in the respiratory murmur; a prolonged expiratory sound; bronchial respiration and bronchophony, heard more distinctly on one side, and most to be depended on as a sign of incipient phthisis when heard towards the point of the shoulder; mucous crepitation; increased resonance of the voice; in some cases, extremely indistinct respiratory murmur; puerile respiration in the sound parts of the lungs. The heart sounds are peculiarly distinct over the whole chest.

In *confirmed* phthisis, one or more of the following physical signs are superadded to the foregoing:—coarse crepitation; more decided bubbling sound or click, which is most distinctly heard when the patient coughs or takes a full inspiration; cavernous rhonchus; cavernous respiration; pectoriloquy; amphoric resonance; metallic tinkling; distinct gurgling when the patient coughs; and, in rare cases, equally distinct sound of fluid in motion on succussion; the cracked-metal sound, on sharp percussion. The situation in which these sounds occur, and the limited space which they occupy, will generally serve to distinguish phthisis from other conditions of lung productive of the same or similar sounds.

The sputa are at first frothy, as in bronchitis; then mucous, then flocculent, resembling "irregular balls of flock or wool, of a yellow or greenish colour, sinking and breaking down in water;" and lastly purulent, often sinking in water, and sometimes containing particles of clotted matter, like softened cheese. The sputa are often streaked or spotted with blood; sometimes they are discharged in the masses, designated "nummular sputa," which the patient compares to "oysters." In rare instances, distinct portions of pulmonary tissue are spit up, having under the microscope the appearance depicted in Fig. 48, p. 199, and still less frequently cretaceous or earthy matter. The frothy and mucous expectoration attend the early stages of phthisis, the flocculent and purulent the more advanced. Hæmoptysis may occur both in the early and in the advanced stages.

MORBID ANATOMY.—In the lungs, tubercular matter, as miliary tubercles or granulations scattered through the lungs; or as opaque yellowish-white or cheesy masses infiltrated into their texture. Cavities of various size and shape, sometimes found in every part of the lung, but generally confined to the upper lobes, larger and more numerous on the right than on the left side. The liver enlarged, and changed in appearance and consistence (the fatty or nutmeg liver). Tubercular deposits in various organs of the body. Tubercular ulcerations of the larynx, trachea, and intestines (see partial enteritis). Of Louis' cases, ulceration of the larynx occurred in $\frac{1}{5}$, of the trachea in $\frac{1}{3}$, of the intestines in $\frac{5}{6}$. Tubercle is originally a cellular formation, the constituent cells being imperfectly developed; many are little more than mere nuclei, and the largest are rather smaller than pus corpuscles. Virchow shows that the tubercle corpuscles, like those of pus, are developed from the corpuscles of the connective tissue. As long as the cells remain unaltered, the tubercle retains its grey semi-transparent appearance, but sooner or later they become disintegrated into fatty granular débris, and the tubercle is changed into a yellowish cheesy mass. Fig. 66 shows the whole succession of transitions from (*a*) the connective tissue corpuscles, up to the production by the division and multiplication of their nuclei, of the tubercle corpuscles (*b*). These in the centre of the tubercular mass are undergoing disintegration into cheesy matter (Virchow).

Fig. 66.



Complications.—Bronchitis, pneumonia, and pleurisy, followed by adhesions or by pneumothorax. Ulceration of the larynx and trachea. Disease of the liver; peritonitis; œdema of the ankles, anasarca, ascites; ulceration of the intestines; fistula in ano; mania.

Duration.—Average about two years. In acute cases, from a few months to one or two years. In very acute cases, three weeks or a month. In chronic cases, death often takes place after the lapse of years, and after repeated attacks of hæmoptysis.

Causes.—*Predisposing.* Hereditary predisposition (in about one-fourth of the cases); the scrofulous diathesis; adult age. The male sex. A particular formation of the body, marked by a long neck, prominent shoulders, narrow or deformed chest, long slender fingers, with filbert nails, regular, white teeth, and gums with a deep red margin; thin upper lip; a fine clear skin, delicate complexion, fine hair; debility. Dr. Buchanan's recent laborious researches have elicited the important and comprehensive fact, that "*wetness of the soil is a cause of phthisis to the population living upon it.*"—*Exciting.* Foregone attacks of pneumonia, catarrh, asthma, scrofula, syphilis, variola, rubeola. The dust to which certain artificers are exposed, as needle-pointers, stone-cutters, pearl-button makers, millers, &c. Irritating fumes.

Mortality.—The disease is fatal (but often after several attacks) in the vast majority of cases. It destroys about a ninth part of the

English population, and about a fifth of those who attain the adult age. In the metropolis it causes about a seventh of the deaths at all ages, and about a fourth of those of adults. The old bills of mortality show a like proportion of deaths among adults.

Diagnosis.—The symptoms and physical signs taken together render the diagnosis of confirmed phthisis easy, but it is often difficult in the incipient stage, in cases of extensive miliary deposit without suppuration, and when complicated with other chest affections. The following observations may facilitate the diagnosis. The first onset of phthisis is marked by very slight and very variable symptoms, such as debility; debility and slight emaciation; perspiration on slight exertion; dyspepsia; diarrhœa; slight hæmoptysis; hacking cough, with scanty mucous expectoration in the morning; palpitation. A few well-directed inquiries will generally bring to light some additional symptom. In all obscure cases, the character of the pulse specially deserves attention, as it affords indications quite as valuable as those obtained by an examination of the chest. When the disease is advanced it is most liable to be confounded with bronchorrhœa, with dilated bronchi (see Bronchitis), and with suppuration of the lung after pneumonia. From the latter it will be distinguished by the previous history, and by the character of the sputum.

The Pulse in some cases excites suspicion, in others confirms it, by 1, increased frequency; 2, diminished volume; 3, increased quickness or sharpness; or 4, by all three combined.

1. In five cases out of six the number of the pulse exceeds the highest number (92) observed in *apparently* healthy males of the same mean age; while in the great majority of instances it exceeds the average. Sometimes this increased frequency of the pulse accompanies the first feelings of indisposition, and continues throughout the disease. I have known it as high as 140, where debility was the only marked symptom. On the other hand, cases do occur, though very rarely, in which the pulse is even less frequent than the average in health. [Jan. 1853.—P.D., aged 34, a policeman. When 24 years old he had an attack of pneumonia (?), which confined him to bed for six weeks. During the attack he spat half a pint of blood mixed with yellow sputa, for several days in succession. When 26 years of age, he had an attack of pleurisy, for which he was bled. During the two years that he has been in the police force he has always had a cough, and when aged 33, again spat a little blood. Spits large quantities of yellow sputa, but no blood at present. There is dulness on percussion above and below both clavicles, with cavernous respiration, increased expiratory murmur, and pectoriloquy above the right clavicle; increased expiratory murmur and slight crepitus about the left clavicle. Pulse, standing, 64. He is still able to follow his employment. August, 1853.—External appearance and symptoms little changed, but the pulse now above 100, in the same posture. June, 1858.—Still in delicate health, but following his employment as a beadle.]—2. The diminished volume of the pulse is an almost constant character, and is present even in such excep-

tional cases as the above.—3. The quickness of the pulse—that is to say, the promptitude with which each separate pulse rises beneath the finger—is also even more constant than the increased frequency, and may exist with a pulse of 70. The pulse of health is exactly the reverse of this, rising slowly, and, as it were, deliberately, beneath the finger; so also is the infrequent pulse of mere debility. To quickness is superadded smallness of pulse in phthisis, whilst the pulse in health is of moderate fulness.—4. The combination of the three characters of pulse—the frequency, the smallness, and the quickness—should always lead to an examination of the chest; but the small quick pulse alone is sufficient ground of suspicion. These observations apply only to men, as the characters here pointed out form a striking contrast to those of the male pulse both in health and disease; while, on the contrary, the pulse of the female, even in health, possesses these three characters in a marked degree, and assumes them in most functional and in many organic diseases. A small, quick, and frequent pulse is, therefore, less indicative of consumption in women than in men. The slight effect produced by a change from the erect to the sitting posture will also assist the diagnosis in the male, by distinguishing the debility of phthisis from simple debility due to other causes. Whenever, then, a man presents himself for advice, complaining of debility, or of other obscure symptoms of phthisis, or even of symptoms proper to functional diseases of other organs, and is at the same time obviously free from acute disease, the pulse should be examined, and if, after allowing the patient's agitation to subside, it is either very small and frequent, or very small and quick, or if it combine the characters of increased frequency, smallness, and quickness, the chest should be examined, and in by far the majority of cases the physical signs will justify the suspicion raised by the pulse. In examining persons offering themselves for assurance, the state of the pulse should be particularly attended to. It may be well to observe that, in consequence of the quickness of the pulse (the promptitude with which each beat is performed usually seems much less frequent than it is), it should, therefore, be always counted by the watch. (G.)

Headache.—A dull, persistent pain in the forehead and over the eyes has often led me to examine the chest, and in most instances with the result of confirming my suspicions. (G.)

Palpitation.—This too may be the very first symptom to engage the patient's attention. (G.)

Prognosis.—*Unfavourable*, as to the ultimate event, but guarded as to that of an existing attack, for the patient may survive three, four, or more severe attacks. An existing attack is likely to terminate fatally when there is a high degree of hectic fever; great frequency of pulse and respiration; great emaciation and debility; a morbidly-clean or fiery-red tongue; fixed pain in the chest; colliquative sweats or diarrhœa; profuse purulent expectoration; œdema of the legs; aphthæ; and stethoscopic indications of extensive and advanced disease, or of the supervention of pneumonia or pleuritis.

There is a better prospect of a favourable result to an existing attack when the disease is limited in extent, and not traceable to hereditary predisposition; when there is little loss of strength and flesh; when the pulse and respiration are little increased in frequency; when there are no night-sweats, no diarrhœa, and no complications. When the disease is very limited, ultimate recovery is a possible, though very rare, event; and every experienced physician has met with a few cases in which men who had every symptom of consumption in early manhood have attained advanced age. In females, the first attack is more generally fatal than in males.

Pneumonia in the young or middle-aged adult, not yielding to treatment, and accompanied by rapid loss of flesh and strength, is probably due to tubercular deposit. Bronchitis also, occurring at the same periods of life, and characterised by similar features, is probably due to miliary deposits occupying the whole, or the greater part of, both lungs.

TREATMENT.—I. Of incipient phthisis. II. Of confirmed phthisis.

I. In *incipient* phthisis, the indications are—(*a*) To promote the absorption of the tubercular matter; (*b*) To prevent or subdue local inflammation; (*c*) To improve the general health.

(*a.*) With a view to promote the absorption of tubercle, iodide of potassium or of iron may be prescribed. Iodine may also be inhaled with the steam of warm water.

(*b.*) Local inflammation may be prevented by guarding against cold and all causes that excite the circulation. Warm clothing; the avoidance of wet and cold; and due attention to the secretions, will fulfil the first part of this indication. Inflammation may be subdued by leeches applied occasionally over the site of the painful spot; by counter-irritants to the upper parts of the chest, of which croton liniment and tartar-emetic ointment are the best.

(*c.*) The general health may be improved by proper exercise, wholesome diet, regular habits, pure air, change of air, especially to the sea-side, sea voyages, cold sponging followed by friction every morning. Chalybeate tonics. Iodide of iron. Cod-liver oil if there be emaciation.

II. In *confirmed* phthisis—that is to say, where suppuration has already taken place—the indications are—(*a*) To facilitate expectoration; (*b*) To subdue local inflammation; (*c*) To mitigate distressing symptoms; (*d*) To support the patient's strength.

(*a.*) The first indication is fulfilled by emetics. When the patient's strength is little impaired, and the expectoration is abundant, they may be given with the best effect. A scruple of sulphate of zinc should be taken on first rising in the morning, every day, or on alternate days, or once or twice in the week, according to the strength of the patient, and be followed up by a moderate quantity of warm water or warm camomile tea.

I am inclined to restrict the use of emetics to those cases in which there is abundant expectoration. In incipient phthisis, attended with a dry cough, or scanty expectoration, emetics are as useless as they might *à priori* be expected to be. (G.)

(*b.*) Local inflammation must be combated as before indicated.

(*c.*) The most distressing symptoms are night-sweats, coughs, febrile flushes, palpitations, sickness, diarrhœa, and hæmoptysis. The *palpitation* may be relieved by digitalis, in doses of from x to xx drops of the tincture; the *cough*, by small doses of opium, compound squill pill, in combination with the extract of conium, or by small and repeated doses of the more powerful sedatives. Of these the best is extract of stramonium, in the dose of the sixth of a grain made into the form of lozenge with extract of liquorice, and sucked frequently in the course of the day and night when the cough is most urgent. A linctus containing chloroform and hydrocyanic acid may also be given with advantage. The *febrile flushes* are relieved by tepid sponging and cooling drinks. The *night-sweats* often subside under the use of the dilute sulphuric acid, in the dose of twenty drops. This may be combined, when there is much restlessness, with a quarter of a grain of morphia. The distressing *sickness* which sometimes accompanies phthisis is relieved by the use of hydrocyanic acid and bismuth (Form. 85), with a bland farinaceous diet. *Diarrhœa* commonly subsides by strict regulation of the diet, and the prohibition of every form of solid food. If it be caused by ulceration, the treatment recommended under partial enteritis must be adopted. In *hæmoptysis*, the dilute mineral acids (Form. 163), or, if these fail, Form. 173, 175, 213.

(*d.*) The patient's strength is best supported by nourishing and unstimulating diet. In the last stage of the disease, however, stimulants, such as wine and ammonia, may be given with advantage.

REMEDIES.—Neat's-foot oil. Glycerine. Cod-liver, or neat's-foot oil rubbed into the skin of the chest, when the stomach rejects them. The inhalation of oxygen, iodine, chlorine, hydrogen, hydro-carbon, and the vapours of tar. Alcohol. Naphtha. The Iceland or Irish moss.

In incipient phthisis, a sea voyage, or a change of air and scene, or a change from a low damp spot to a dry bracing air, prove as useful as to other persons whose health is impaired from whatever cause. This is probably the extent to which change of climate is beneficial in the early stage of phthisis. As, however, it has been shown that, in the East Indies, there is among our troops, as well as among the natives, a comparative immunity from consumption, a residence in that climate may be reasonably recommended, both to persons labouring under the incipient disease, and to families deeply tainted with scrofula. The places now usually recommended have not this probability in their favour, and the evidence in support of the change is on a level with that in favour of tar-water, naphtha, frictions to the spine, or dry-cupping to the chest. The fact is, that everything that has ever been recommended, however trivial, has seemed to effect a cure of consumption, simply because patients suffering from it do continually recover from existing attacks, and in rare instances regain perfect health, though pent up in towns, breathing the foul air of crowded workshops, living in unhealthy habitations, and surrounded by every unwholesome influence; exposed, in a word, to the continued action of the predisposing and exciting causes of the disease; while, on the other hand, many cases, stated to be phthisis, are merely sympathetic functional disorders of the lungs, or real diseases of the lungs of a non-tubercular origin. To recommend a change of climate in advanced stages of consumption is both unwise and cruel. But in incipient cases, a change may be fairly recommended, if it do not entail great inconvenience; for it is always a choice of evils, which ought to be fairly stated. The benefit is not sufficient to counterbalance great inconvenience or a large pecuniary sacrifice. (G.)

PROPHYLAXIS.—Persons who have an hereditary predisposition to phthisis, and those who have habitually delicate health, require unusually careful management. During childhood, nourishing and wholesome food, proper exercise, warm clothing, pure air within doors, both in day and sleeping-rooms, moderate application of the mind, and careful attention to the state of the bowels, are necessary. During youth and manhood such exercises as tend to expand the chest, especially fencing and military drill for men, and archery for women; exercise in the open air, especially horse exercise; the cold sponge with bath every morning, followed by friction; the moderate employment of the voice in singing or reading aloud; and careful avoidance of all excesses, bodily or mental, should be insisted on. All unwholesome employments and all sedentary occupations should be avoided. Residence in a dry warm climate, such as Undercliff, Torquay, Hastings, Cork, Madeira, the East and West Indies, the south of France, or Italy, Algiers, Cape of Good Hope, or Australia. Astringent chalybeate tonics.

DISEASES OF THE PLEURA.

PLEURITIS . . .	Inflammation of the pleura.
HYDROTHORAX . .	Water in the chest.
PNEUMOTHORAX . .	Air in the chest.

PLEURITIS—INFLAMMATION OF THE PLEURA.

VARIETIES.—1. Acute. 2. Chronic.

1. ACUTE PLEURISY.

SYMPTOMS.—*General.* After rigors, and the symptoms of inflammatory fever, a sense of weight in the chest, which in a few hours becomes acute pain, referred to the side, about the level of the nipple, thence shooting to the sternum, clavicle, and arm-pit, and in rare cases over the whole of the affected side. There is a short dry cough, unless the disease be complicated with bronchitis, pneumonia, or phthisis: in which case, the patient expectorates sputa characteristic of those diseases. The countenance is expressive of anxiety; the breathing is short and catching, and performed chiefly by the abdomen; the pain is increased by deep inspiration, by the act of coughing, or by lying on the affected side. The pulse is frequent, hard, and contracted, vibrating under the finger like the tense string of a musical instrument. The tongue is covered with a white fur ; the urine is scanty and high-coloured ; the skin hot, and the cheeks flushed.

Sometimes severe and extensive pleurisy occurs without these marked characters. The pain is more diffuse, less severe, or produced only by pressure between the ribs of the affected side; and in some instances it is altogether absent. In most cases the acute pain, as well as the fever, subside on the third or fourth day, and the cough and dyspnœa abate, though the pleura is still inflamed.

Local.—When the disease is recent, the effusion scanty, and the surfaces of the pleuræ not adherent, there are feeble respiratory murmur from diminished motion of the chest, slight dulness, friction-sounds, cessation of vocal fremitus, and ægophony. If adhesion takes place, the friction-sounds cease ; and if effusion occur to a considerable extent, the physical sounds are those stated under Empyema.

TERMINATIONS.—In resolution ; in adhesion ; in effusion followed by collapse of the lung; in the chronic form.

MORBID ANATOMY.—Injection of the subserous cellular membrane with dryness of the surface of the pleura ; effusion of coagulable lymph, or of pus mixed with flakes of lymph ; and recent adhesions.

CAUSES.—*Predisposing.* Rheumatic diathesis.—*Exciting.* Cold; external injuries, fractures of the ribs, &c. ; febrile states of system ; inflammation of adjoining textures ; tubercles in the lung ; fever.

DIAGNOSIS.—From *pleurodyne*, by the severe constitutional symptoms and characteristic local signs. From other diseases of the chest, by the physical signs.

PROGNOSIS.—*Favourable.* A recent attack promptly treated ; absence of complications ; if the disease be not recent, the absence of hectic, and of great debility.—*Unfavourable.* Rapid and extensive effusion ; implication of both sides of the chest ; the coexistence of organic disease ; hectic fever and great debility ; dropsy.

TREATMENT.—In the robust a full bleeding from the arm to the approach of syncope, followed immediately by full doses (from a quarter to half a grain, or even more) of tartarated antimony, every one, two, or three hours, brisk aperients, and a strict antiphlogistic diet. For slighter degrees of inflammation, cupping and leeches and blisters. The antimony may be usefully combined with calomel. The one keeps up the effect of the bleeding, till the other, by slightly affecting the system, puts a stop to the inflammatory action.

2. CHRONIC PLEURISY.

SYMPTOMS.—Chronic pleurisy is usually a consequence of the acute form, but it sometimes begins as a subacute disease. In either case, hectic fever, a permanently accelerated pulse, emaciation, dyspnœa increased by exertion, and inability to lie on the healthy side, are the chief symptoms. These are apt to alternate with acute symptoms, such as severe pain, and increased hardness of the pulse.

Anatomical Characters.—Effusion of fluid into the sac and coagulable lymph upon the surfaces of the pleura; old and recent adhesions.

Treatment.—The first object is to promote the absorption of the effused matter. For this purpose, mercury (Form. 329) may be given until constitutional effects are produced, or if there be much debility the continued use of iodide of potassium, the infriction of iodine unguents, the repeated application of blisters.

The general strength must be supported by the use of tonics; and in cases of great debility, by stimulants and a nourishing diet.

These measures will often cause the absorption of the effused fluid; but when there is much, and especially when it is chiefly or wholly pus, absorption rarely occurs, and the disease now takes the name of *empyema.*

HYDROTHORAX—EMPYEMA.

The former term signifies a collection of serum, the latter a collection of pus, in one or both cavities of the pleura. The physical symptoms are the same whether the fluid be pus or serum. At first it is impossible to say positively which of these two fluids is effused. The *general symptoms* are those of chronic pleurisy. When the effusion into one side of the chest is considerable there is dyspnœa, increased upon exertion; and upon lying down. There is a distressing weight and oppression at the chest; the face is pale or dusky, and expressive of anxiety. Palpitation is often a distressing symptom. There is a dry distressing cough, with expectoration generally tinged with blood. In describing his sensations, the patient frequently speaks of breathing through water. There is inability to lie on the sound side; but when the disease exists in both cavities of the chest, the patient cannot lie down at all.

When the effusion is purulent, ulceration is apt to occur in some of the surrounding textures, and an opening is formed into the lungs, through the walls of the chest, or through the diaphragm. The bones may also become carious. When the matter points externally, fluctuation is perceived in the part, and the integument becomes tense during expiration. When an opening takes place into the lungs, a large quantity of offensive matter is discharged during a fit of coughing, and this is followed by great relief to the breathing. When the opening forms externally, the discharge of matter is increased by coughing.

The *local signs* are as follows:—Enlargement of the diseased side, proportioned to the extent of the effusion; the ribs raised as in full inspiration; the intercostal spaces bulged, level with the ribs, and sometimes perceptibly fluctuant. When the effusion is great, universal dulness on percussion in all postures, with absence of respiratory murmur; displacement of the heart to the right. When moderate, the dulness on percussion, and the respiratory and vocal sounds shift with the position of the body. Puerile respiration on the sound side, proportioned to the degree of compression on the lung of the diseased side. When the effusion is slight, ægophony, generally most distinctly heard about the angle of the scapula.

TREATMENT.—Having failed to produce absorption by the general and local treatment above mentioned, it will be necessary, as soon as the breathing is seriously affected, to remove the fluid. If we have reason to believe that it is serum, the operation should be delayed as long as is consistent with the safety of the patient; but it should not be delayed so long that the lung becomes completely collapsed and incapable of re-expansion. If we have positive indications that the fluid is pus, we evacuate it at once. If the matter should point in any part of the chest, a large orifice should be made there, by means of a scalpel, for its free evacuation; but if not, we select a spot midway between the spine and sternum, and if the effusion be not very great, a small incision being previously made through the skin with a scalpel, a full-sized trocar should be pushed horizontally inwards, perpendicular to the median plane, above the upper margin of the fifth rib on the left side, of the fourth on the right side. When the effusion is great, we may operate above the fifth right rib, and the sixth left rib. Before the introduction of the trocar, the skin should be drawn upwards, so that afterwards the external and internal opening may not coincide. To prevent the introduction of air during the operation, the canula should be attached to an indiarubber tube, filled with water, and its free extremity suspended in water. By means of a stop-cock the fluid should be allowed to flow *very slowly* from the chest; and meantime we should ascertain, by the stethoscope, whether the lungs are proportionately expanding. As long as they continue to do so, we may allow the fluid to slowly flow; but as soon as they cease to expand the flow should be stopped, or air will be admitted into the pleural sac. The more slowly the fluid is removed, the less chance there will be, both of the admission of air and of renewed effusion. Simultaneously with the withdrawal of the canula, and while the patient is holding the breath, or *expiring*, the integument should be slipped over the orifice in the chest wall, and retained there by means of adhesive plaster. If we discover the fluid to be pus, the canula may be withdrawn, a free incision made, and a drainage-tube inserted.

Pressure by means of a bandage may be advantageously employed both during and after the operation.

In many cases the removal of the fluid, whether brought about by internal remedies or by operation, cannot take place without more or less affecting the shape of the chest; the lung may be either permanently condensed by the pressure, or bound down by firm adhesions. As the fluid, then, is absorbed, the ribs fall in, and the chest shrinks. The shoulder falls, and remains more fixed than that of the sound side, the scapula approaches the spine and is more prominent, and the spine itself is often concave towards the same side. The lung of the sound side, expanding beyond its usual limits, displaces the heart. These changes are accompanied by appropriate physical signs of condensed lung, namely, dulness on percussion, impaired respiratory murmur, bronchophony, and vocal fremitus. When the effusion is partial and confined by adhesions, the contraction is also partial, and the physical signs are more limited in extent. Pleurisy may occur in young people, and lead to great deformity, without much impeding the breathing; but when it attacks the adult, it generally leaves behind it some dyspnœa, with a strong tendency to recurrence.

PNEUMOTHORAX—AIR IN THE CHEST.

Air may find its way into the cavity of the pleura in two ways: 1. By an opening in either the pulmonary or parietal pleura. 2. By secretion. The first is the more common cause.

Symptoms.—These vary with the circumstances under which the opening takes place, and the previous condition of the pleura. When a superficial ulcer of the lung opens into a previously healthy pleural sac, the entrance of air gives rise to dyspnœa, acute pain, dry cough, spasms of the intercostal muscles, a frequent, feeble, and sometimes irregular pulse. These symptoms, which are more or less sudden, according to the size of the opening, are soon followed by those of inflammation of the pleura. When inflammation pre-exists, the presence of air not only tends to increase it, but converts the otherwise inodorous pus into a fœtid fluid.

Physical Signs.—Unusually clear tympanitic sound on percussion, with great indistinctness or total absence of respiratory murmur on the affected side; the breathing has an *amphoric resonance*, and the voice and cough are attended by a metallic ringing echo, like that produced by speaking under a stone arch. There is increased distinctness of the respiratory murmur on the sound side. When there is liquid as well as air in the pleural sac, the physical signs are, dulness on percussion as high as the level of the fluid, which shifts with change of posture; *metallic tinkling*, and splashing on succussion.

Prognosis.—Unfavourable, but life is often prolonged for months.

Treatment.—This depends upon the stage of the disease, and the state of the patient. The sudden rupture of the lung is generally followed by symptoms of collapse and irritation, requiring stimulants and opium; when inflammatory symptoms come on, antiphlogistic measures are required. It may be necessary to resort to local depletion by cupping or leeches, and to counter-irritation. Tartar-emetic may be given in nauseating doses, and the bowels should be kept free by gentle aperients. When extreme dyspnœa is present, an opening must be made with a fine trocar to give exit to the air, and this should be done at a part of the chest below the level of any liquid it may contain. The operation may be repeated if necessary.

CHAPTER IV.

DISEASES OF THE DIGESTIVE CANAL AND ABDOMINAL VISCERA.

1. Diseases of the Mouth, Fauces, and Gullet.
2. Diseases of the Stomach.
3. Diseases of the Intestines.
4. Diseases of the Stomach and Intestines.
5. Diseases of the Peritoneum.
6. Diseases of the Liver, Pancreas, and Spleen.

DISEASES OF THE MOUTH, FAUCES, AND GULLET.

STOMATITIS	Inflammation of the Mouth.
GINGIVITIS	Inflammation of the Gums.
GLOSSITIS	Inflammation of the Tongue.
TONSILLITIS	Inflammation of the Tonsils.
PAROTITIS	Inflammation of the Parotid Gland.
CYNANCHE THYROIDEA . .	Bronchocele.

STOMATITIS—INFLAMMATION OF THE MOUTH.

VARIETIES.—1. Stomatitis erythematosa; 2. S. follicularis; 3. S. fungosa (aphthæ); 4. S. mercurialis; 5. S. gangrenosa.

1. STOMATITIS ERYTHEMATOSA SEU VESICULARIS.

SYMPTOMS.—This is a disease of early infancy, characterised by redness and heat, and sometimes by dryness, of the mouth and tongue, and the eruption of groups of minute vesicles on the top and around the edges of the tongue. It often coexists with inflammation of the stomach and bowels. In infants from the seventh to the ninth month fever is often superadded. The inflammation may extend to the whole mouth, and even to the lips, which swell, excoriate, and sometimes become the seat of *herpes*. The chronic form is often attended by profuse salivation.

TREATMENT.—If the mouth and tongue be dry, lint or fine sponge moistened with thin barley-water should be frequently passed over them. The diet should be of milk combined with a little fluid magnesia, given, if the bowels be irritable, in small quantities at short intervals.

2. STOMATITIS FOLLICULARIS.

Symptoms.—Large, roundish, elevated, white, thick-walled, distinct vesicles, on the inner surfaces of the lips and cheeks, the sides of the tongue and the gums. The vesicles usually present a depressed centre and a minute point, the sealed orifice of the follicle. They soon break, and discharge a little glairy fluid. A minute superficial ulcer, bounded by a red margin and apt to spread a short distance, follows.

The disease attacks children about the time of the first teething. Old people are also liable to it.

Cause.—Inflammation of the mucous follicles, and simple racemose glands, sympathetic with some disorder of the alimentary canal.

Treatment.—For infants ʒj doses of solution of bicarbonate of magnesia, and solution of nitrate of silver locally applied. In adults attention to the disordered function of the alimentary canal.

3. STOMATITIS FUNGOSA—THRUSH.

Under the specific name *fungosa* are included all the aphthous affections known to be due to the presence of fungi.

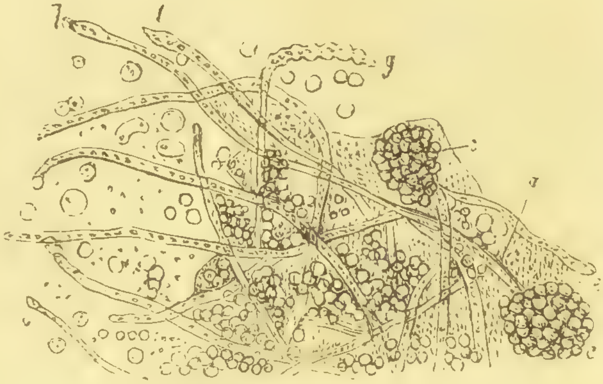
Definition.—Mouldiness of the mucous membrane of the mouth.

Synonyms.—S. membranosa. Aphthæ. Muguet. Millett.

Symptoms.—White, opaque, conical, irregularly-rounded or ring-like, elevated patches, appearing alone or simultaneously on the inner surface of the lips and cheeks, on the gums, palate, tonsils, both surfaces, and especially the sides of, the tongue. Sometimes the disease extends down the œsophagus into the stomach, and along the respiratory passages into the bronchi. In aggravated cases the patches become confluent, and form a loose, ragged membrane of a dirty-white or greyish colour, extending over a considerable portion of the tongue or cheek. They soften down and become ragged on their surfaces, and after a variable time (from ten hours to several days) separate, and leave either a smooth, red, unbroken surface, or a superficial excoriation. The abraded surface may now become covered with healthy epithelium, or the diseased condition may be reproduced. This affection is a frequent accompaniment of gastro-intestinal irritation in weakly infants. There is increased difficulty of sucking and swallowing. If the disease extend into the alimentary canal, it will be liable to produce vomiting and diarrhœa, with mucous stools. Coughing and mucous expectoration, mixed with grey aphthous threads, mark its extension into the air-passages. When the child is in a low state of health, the aphthæ sometimes produce unhealthy sores, the surrounding parts become swollen, soft, and livid, there is profuse salivation ; and the child, refusing food, becomes pale and cold, and at last dies of inanition.

CAUSES.—*Predisposing.* A tender epithelium as in infants, and after desquamation, resulting from local or general disease. The disease affects persons of all ages.—*Exciting.* The development of a parasitic fungus (Oidium albicans) in the epithelial covering of the mucous membrane. The plant consists of minute tubular jointed filaments, and of bright spherical or oval spores developed at the joints and extremities of the filaments. The spores and the joints of the thread-like stems, contain one or two bright rounded granules (Fig. 67). The filaments grow in between the epithelial cells in every direction, and form a network, into the meshes of which the spores are poured, disturbing and loosening the epithelium, which becomes swollen, opaque, and friable. The disease rarely extends below the cellular layer; but as the deepest growing portion of this layer is frequently invaded, the disease is not thrown off when the superficial parts are separated. Sometimes the disease extends to the corium itself, producing unhealthy ulceration. The racemose glands are a favourite seat of the fungus, their little open-mouthed ducts allowing of its ready introduction to the softer cells within them.

Fig. 67.



CONTAGION.—Since the disease is dependent on the growth of a fungus, it follows that its presence, and a favourable condition of the mucous membrane, will always result in its development. The fungus is very probably derived, in the first instance, from some mouldy article of diet. When once established, it may spread from one child to another throughout a foundling hospital. The disease may be conveyed from the child's mouth to the nurse's nipples, and from the latter to the mouths of other children; and by the common use of domestic articles, baths, &c.

TREATMENT.—Gastric irritation and diarrhœa, which frequently attend this disease, must be treated on general principles. The mouth should be frequently gargled (Form. 69). Solution of nitrate of silver (gr. xx to ℥j) should be applied once or twice a day by a brush to the aphthous patches. Under this treatment the disease soon yields.

Aphthous ulcers of the mucous membrane of the lips and tongue are frequent concomitants of skin disease caused by vegetable parasites. I have frequently observed them in persons affected with dermmycosis circinata (herpes circinatus). The fungus represented in fig. 68 is from a case in which the external disease was confined to two large semicircles on the upper lip. On the tongue were two aphthous ulcers, both near the tip, one was quite depressed, as if partially cicatrised, and extended into the vascular corium. The epithelium forming the margins of the ulcers was opaque and thick and contained the fungus. All parts of the mucous membrane are liable to be affected by vegetable parasites, and especially when the vital powers of the individual are depressed, as in the last stages of lingering diseases. The specimen of Oidium albicans represented in fig. 69 is from the kidney of an aged patient who came under my care in King's College Hospital. She was admitted in the last stage of pulmonary consumption; her nervous power was much depressed, as was indicated by apathy and low temperature of body. The parasite had invaded the vascular tissue of the mamilla for the distance of about a line between the terminations of the tubules. The patient had no cutaneous disease. The vulva and nipples are very liable to the aphthous affection.

Fig. 68.

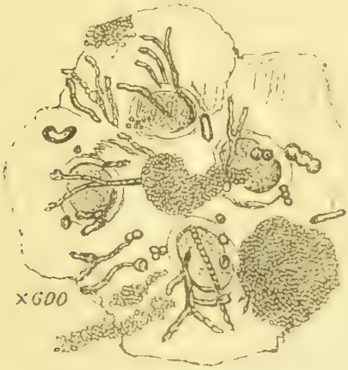
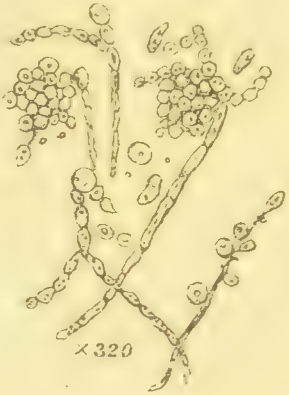


Fig. 69.



4. STOMATITIS MERCURIALIS—MERCURIAL SALIVATION.

SYMPTOMS.—A disagreeable brassy taste, looseness of the teeth, tenderness of the gums, a peculiar fœtor of the breath, and a constant profuse discharge of saliva, with shreds of epithelium; shooting pains in the face, stiffness of jaw, and swelling of the parotid and submaxillary glands. The gums are first marked by a distinct red line, and then become generally red and swollen; little ashy superficial ulcers appear upon them, and they are apt to bleed; after a few days, pus oozes from their margins here and there, and they are more or less separated from the teeth. The inflammation may extend to the interior of the cheeks and to the tongue, which then becomes swollen, indented by the teeth, and furred; and it sometimes proceeds to ulceration of the gums and cheeks, and, in rare cases, to gangrene. These local symptoms are accompanied by slight irritative fever.

The duration of mercurial salivation, in slight cases, is two or three days; in severe cases, ten days or a fortnight; and if ulceration or gangrene ensue, still longer. Several weeks often elapse before the gums are restored to their healthy state.

CAUSES.—The accumulation of mercury in the system from internal administration or external application of some of its compounds.

Some persons are exceedingly susceptible of mercury, while others are with difficulty brought under its influence. Great vigilance is therefore required in its use. Severe stomatitis, with slight ulceration and bleeding of the gums, swelling of the salivary and cervical glands, and severe pain in the jaws, may be induced in three days by the infriction of 100 grains of mercurial ointment into the groins, and the internal administration of gr. iii ss. of calomel in divided doses. A similar condition may be induced by the repeated application of the ung. hyd. oxidi rubri to an extensive ulcerated surface.

DIAGNOSIS.—In most cases, mercurial salivation is distinguished from that of pregnancy, that produced by preparations of antimony, copper, arsenic, and gold, by digitalis, prussic acid, and iodide of potassium, and by several other substances, by the excessive fœtor of the breath.

TREATMENT.—Gargles of alum, zinc, chloride of soda, chloride of lime, tannic acid, hydrochloric acid, acetate of lead, or brandy and water. In more severe cases, and when the gums are ulcerated, a strong solution of nitrate of silver (Form. 182), applied by a brush, or nitrate of silver, or sulphate of copper in substance. If much swelling of the glands be present, leeches to the jaws, followed by blisters behind the ears, and warm fomentations; and if there be much irritation, opium. Saline aperients, and moderate doses of quinine with acid, complete the treatment.

5. STOMATITIS GANGRENOSA—GANGRENE OF THE MOUTH.

SYNONYMS.—Cancrum oris; Noma.

SYMPTOMS.—The attention is often first called to a circumscribed, indolent, hard, shining swelling on one cheek (generally the left), without pain, heat, or redness. On examining the mucous membrane of the mouth, one or more ulcers, blisters, or white eschars, will be found on the internal surface of the cheek, lips, or gums. These gradually increase in size, and discharge a dirty, sanious, offensive fluid; at the same time the saliva, increased in quantity, flows from the mouth mixed with membranous shreds. The swelling of the cheek increases till it involves the eyelids and lips. A dark livid spot now occupies the centre of the swelling, enlarges, softens, and sloughs. Gangrene, having set in, makes rapid progress both within the mouth and on the surface, and at length involves the cheek, lips, and gums, and in extreme cases the nostrils, eyelids, neck, and pharynx; the teeth fall out, and the bones of one or of both jaws, and even the cheek and frontal bones, are ultimately attacked. The constitutional symptoms by no means keep pace with the severity of the local affection. In most cases there is no fever, no loss of appetite, and little impairment of strength. The little patient often continues to run about and play, to sit up, and to amuse himself, till within a short period of his death, the faculties of the mind remaining intact. More rarely the local symptoms are accompanied by fever. Still less frequently the child becomes delirious. Recovery is indicated by reaction.

Death results from asthenia, of which the disease is the outward indication.

COMPLICATIONS.—Pneumonia (58 cases in 63); pleurisy; enteritis; gangrene of the lungs, pharynx, œsophagus, and stomach; gangrene of the extremities, and of the vulva: scrofulous affections.

CAUSES.—*Predisposing.* Inflammation of the lungs, or intestines; childhood, and all causes of debility.—*Exciting.* The animal poisons which produce measles; small-pox; scarlatina, &c.; pneumonia; congenital syphilis.

DIAGNOSIS.—From *gangrenous aphthæ*, by these being confined to the secreting follicles of the mucous membrane, by their number, small size, and slow course, and the absence of cutaneous swelling. From *malignant pustule* (a gangrenous affection of the skin unaccompanied by any disease of the mucous membrane), by the absence of the fever which precedes that affection. From *anthrax*, by the absence of acute pain and inflammatory symptoms. Anthrax is very rare on the cheek. From most cases of *scurvy*, by that disease being confined to the gums. From the effects of *mercury*, by the history of the case, by the swollen gums and tongue, the abundant flow of saliva, the peculiar odour of the breath, and the numerous superficial ulcerations. The diagnosis is very difficult when either affection is of some standing, and the previous history obscure.

PROGNOSIS.—Extremely unfavourable. Mortality about 75 per cent. An early age, previous great exhaustion, and treatment postponed till the gangrene has fairly set in, are unfavourable circumstances.

TREATMENT.—I. The *local* treatment consists in the use of stimulating applications. Previous to the appearance of the livid spot, stimulating embrocations, such as the linimentum camphoræ compositum, or the linimentum ammoniæ, to the cheek, or chloride of soda or of lime mixed with water to the consistence of a stiff paste, or the muriatic or pyroligneous acid, or lunar caustic. Should gangrene have set in, strong acetic or nitric acid. When the eschar has separated, the chloride of soda or the chloride of lime in solution, or the weaker acids, may be resumed.

II. The *general* or *constitutional* treatment will be determined by the previous history and actual condition of the patient. Pure air, scrupulous cleanliness, and nourishing diet, are obviously indicated in all cases. Beef-tea, thickened with arrow-root, arrow-root made with milk, calf's-foot jelly, and wine diluted with water, or added to nourishing articles of food, should be freely and frequently administered.

Quinine in the diluted acids, or in wine, and carbonate of ammonia, are the best medicines.

If constipation be present, compound rhubarb or jalap powder, followed by castor-oil or saline aperients, must be given, as often as requisite. Diarrhœa must be checked by the pulv. cretæ aromaticus c̄ opio, or other suitable remedies adapted to that disorder, especially injections of starch and opium; pneumonia, if present, by opium, with full doses of liquor ammoniæ acetatis.

GINGIVITIS—INFLAMMATION OF THE GUMS—PAINFUL DENTITION.

Symptoms.—Dentition is generally accompanied by salivation; a red, hot, painful, and swollen state of gum. The infant puts its fingers, or whatever it can grasp, into the mouth, and presses the gums upon it. But when true inflammation is present, the child will not bear even the pressure of the nipple. This intense inflammation of the gum may extend to the lining membrane of the mouth, and be followed by ulceration, followed by aphthæ, or gangrene.

The general symptoms are feverishness, fretfulness, disturbed sleep, determination of blood to the head, often accompanied by diarrhœa and colic; and inflammation of the brain or its coverings. In extreme cases, water in the head, with convulsions, inflammation of the lungs, or laryngismus stridulus. Skin diseases are also common complications, especially lichen and strophulus.

Treatment.—In mild cases, gentle friction of the gums; in more severe cases, scarification. Warm bath, simple diet, and a strict attention to the state of the bowels, complete the treatment. The attendant diseases must be treated on general principles.

Incision of the gums ought not to be practised unless they are swollen, hot, and painful from the pressure of the teeth. When the incision is made prematurely, the eruption of the tooth, so far from being accelerated, is retarded. The incisions should be deep and free. One incision should be made parallel to the alveolar margin; and a second transverse to the first.

The gums are subject to swelling, ulceration, and gangrene, both in infants and adults. In the adult, they are generally parts of other diseases, such as scurvy, or mercurial salivation; in young children, they are commonly idiopathic.

GLOSSITIS—INFLAMMATION OF THE TONGUE.

Symptoms.—Inflammation of the whole tongue is rare, except as the sequel of profuse salivation, or of strong irritant applications. More commonly it is of limited extent, appearing at first as a hard tumour on the upper surface, which suppurates slowly, and leaves a deep ulcer, sometimes penetrating the tongue. It arises, in most instances, from gastric or intestinal irritation, and is cured by purgatives and the application of nitrate of silver.

Inflammation of the whole tongue is often a severe and dangerous disease, marked by heat, swelling, and pain, difficult speech and deglutition, dyspnœa, salivation, swelling of the veins of the neck, and determination of blood to the head, with inflammatory fever.

TERMINATIONS.—In resolution, suppuration, or gangrene. In extreme cases it threatens suffocation or apoplexy.

CAUSES.—Mechanical injuries; strong irritants; the sting of insects; salivation; extension of diseases affecting the tonsils, gums, and cheeks.

TREATMENT.—In the early stage, local depletion, according to the severity of the symptoms, with brisk purgatives and antiphlogistic remedies, with ice to the surface of the tongue. In a more advanced stage, incisions. If suffocation threaten, tracheotomy must be performed.

Ulceration sometimes takes place on the side of the tongue, from the irritation of a decayed tooth, which must be filed or removed.

Epithelial cancer of the tongue is known by its peculiar hardness, the irregular ulceration, the acute lancinating pain, and the cachectic state of the patient.

Syphilitic ulcers of the tongue, with foul surface and irregular hard margins, occupying chiefly its edges, require a course of mercury or iodide of potassium, with the application of solid sulphate of copper, or nitrate of silver.

TONSILLITIS—INFLAMMATION OF THE TONSILS.

1. ACUTE TONSILLITIS.

SYNONYMS.—Cynanche tonsillaris. Angina tonsillaris. Amygdalitis. Quinsey. Inflammatory sore throat.

SYMPTOMS.—After rigors, followed by flushes, pains in the back and limbs, and a full, frequent, and compressible pulse,—a sense of fulness, heat, and dryness in the throat, pain and difficulty in swallowing, and speaking. The throat presents a diffused redness, of a deeper tint over the tonsils, which are swollen, and sprinkled with greyish-yellow spots consisting of secretion from the gland blocking up the mouths of its follicles. The tongue is coated with a white creamy fur. As the disease advances, the swelling of the tonsils increases; the acts of swallowing and speaking become more difficult and painful; liquids return through the nostrils, there is a constant discharge of viscid saliva, the respiration is affected, and there is a painful sense of tension, with acute darting pains in the ears. The febrile symptoms increase in severity, and the pain in the back and limbs becomes more acute; but in a more advanced stage, the fever often subsides, or changes its character from inflammatory fever during the first stage, to mild hectic during the stage of suppuration.

DURATION.—From five to seven days.

TERMINATIONS.—By resolution, suppuration, ulceration, or gangrene; or in chronic enlargement.

PROGNOSIS.—The disease usually terminates by resolution. Suppuration is to be feared when the disease does not yield to remedies, when the local pain is acute and throbbing, or when there are rigors or cold shiverings. An abscess is indicated when there is much swelling, a sense of fluctuation on pressure with the finger, a whiteness of some part of the tumour, and, finally, purulent expectoration. Gangrene is to be dreaded, if the fever be intense, and the pain extremely violent, without any sign of resolution or suppuration. A pinched and sunken countenance, the extremities cold and covered with a clammy perspiration, a small, frequent, weak, and intermittent pulse, and a very fœtid odour issuing from the mouth, are signs of its existence.

CAUSES.—*Predisposing.* Youth, debility, syphilis, previous attacks. —*Exciting.* Cold; cold drinks while the body is heated; the deglutition of acrid or stimulating substances.

TREATMENT.—When the disease is slight, the treatment proper to catarrh. When more severe, the tonsils should be scarified and leeches applied below the angles of the jaws, followed by a mustard poultice to the throat, and a brisk aperient. When, however, the gland suppurates and feels tense and yielding, a lancet should be thrust directly backwards into the most prominent part, and the pus evacuated. The mouth should then be gargled repeatedly with warm water. When the tonsils are so swollen as to impede the breathing, emetics sometimes give relief. If the skin be hot and the pulse strong, saline diaphoretics should be given; but if the patient is very weak, quinine, beef-tea, and wine, must be prescribed.

2. CHRONIC TONSILLITIS.

SYMPTOMS.—Enlargement and induration of the tonsils, which, projecting towards the middle line, impede deglutition, vocalization, and hearing. The mouth is often kept partially open; the respiration is audible and the voice sibilant.

CAUSES.—*Predisposing.* Syphilis, scrofula, and chronic dyspepsia. —*Exciting.* Acute inflammation of the gland.

TREATMENT.—*General.* Chalybeate tonics with iodine, change of air, warm clothing.—*Local.* Strong solution of nitrate of silver, astringent gargles (Form. 203), occasional application of a leech or small blister to the angles of the jaws. Iodine unguents and liniments.

When the above remedies are unavailing, and the tonsils are of such a size as to impede deglutition or respiration, or to affect the voice, excision may be practised.

Ulceration of the tonsils may occur in disordered states of health, but it is generally a secondary effect of syphilis. The disease is slow in its progress; but, if not checked, it extends into the nostrils and fauces, and ultimately attacks the larynx itself. A gargle of chloride of soda may be used with advantage, and the ulcers may be frequently touched with nitrate of silver. The general health must be carefully attended to, and the strength be supported by a nourishing and generous diet. *Syphilitic ulceration of the tonsils* requires the same treatment as other secondary diseases.

The disease known as "*Clergyman's sore throat*," or "*dysphonia clericorum*," consists at first in a chronic enlargement of the tonsils and lengthening of the uvula, with a relaxed and congested condition of the mucous membrane of the fauces, which gradually extends to the pharynx and upper part of the larynx. In the most severe cases of the disease, there is also ulceration of the mucous follicles of the parts affected, and the mucous membrane, especially about the pillars of the fauces, is coated with a tenacious secretion. The *symptoms* are dryness and tickling of the throat, constant hawking and spitting, and hoarseness increased after reading or speaking, and attended sometimes with pain in the upper part of the windpipe. The disease is generally traceable to a bad habit of reading and speaking in unhealthy persons. The treatment consists in the exhibition of alteratives and tonics to improve the general health, the particular remedies employed being determined by the state of the system; and in local measures directed to remove the relaxed and congested state of the mucous membrane. The best local remedy is a strong solution of nitrate of silver (gr. v to ℥j) applied, by means of a camel's-hair brush or a piece of sponge, to the whole of the inflamed surface. If this mode of application should prove insufficient, the solution of nitrate of silver may be applied to the upper part of the larynx by means of a whalebone probang tipped with sponge. When there is great enlargement of the tonsils of long standing, excision may become necessary, as in simple chronic tonsillitis. Clergymen suffering in this way should be directed to take a full breath very frequently while reading or preaching, so as to speak from the lungs and not from the throat; and to take lessons in elocution.

PAROTITIS—CYNANCHE PAROTIDEA—THE MUMPS.

SYMPTOMS.—After slight febrile symptoms, fulness and soreness at the angle of the jaw, with pain on moving the part. The swelling extends by degrees upwards to the space between the cheek and ear, and downwards to the submaxillary gland, occasioning great deformity. On the fourth day it begins to subside. It is generally confined to one side, but sometimes it attacks the other afterwards; it rarely attacks both sides at once. The disease is sometimes accompanied, and sometimes followed, by painful swelling of the breasts or testicles. It generally terminates in resolution.

Suppurative inflammation of the parotid is a frequent concomitant of the latter stage of typhus and enteric fevers. The inflammation is often developed with remarkable rapidity. Without any premonitory indication, a large congested, very hard and painful swelling forms round the ramus of the jaw in a few hours; and the inflammation rarely stops short of suppuration.

CAUSES.—*Predisposing.* The period of childhood.—*Exciting.* Exposure to cold; scarlatina, and other febrile diseases.

CONTAGION.—A medical student had mumps in London, while his mother was staying with him. They remained in town until the swelling disappeared, and then went 100 miles into the country. There was no mumps in the neighbourhood; but a fortnight after their arrival one of the children was taken ill with it, and it afterwards successively affected, at regular intervals of a fortnight, each member of a large family.

TREATMENT.—Warm fomentations, with the application of flannel in the intervals; gentle aperients and farinaceous diet. If much inflammation be present, leeches may be applied. The secondary affection of the breasts or testicles must be treated in the same way. Should any swelling remain after the inflammation has subsided, friction with stimulating liniments may be prescribed.

BRONCHOCELE—CYNANCHE THYROIDEA—GOITRE.

SYMPTOMS.—A swelling affecting the entire thyroid gland, or a single lobe of it; at first firm and elastic, but after a time soft, with flabby, small portions of a denser consistence. It grows slowly at first, but after a time rapidly, extending upwards towards the jaw, laterally beyond the limits of the neck, and even hanging over the chest. It sometimes attains an enormous size, and then causes serious inconvenience by its pressure on the trachea and vessels of the neck.

MORBID ANATOMY.—Hypertrophy of the gland, partial or entire, with enormous enlargement of its vesicles, so as to present, when cut into, cavities often of considerable size, and containing fluids of various character and consistence.

CAUSES.—*Predisposing.* Female sex; puberty; hereditary tendency.—*Exciting.* Unknown. The disease is endemic in localities differing widely from each other in all respects. But the most common characteristic of the spots in which it prevails is want of due movement of the air. It is very common in deep valleys shut in by mountains. Combined with every degree of idiocy and imbecility it is the *Cretinism* of the Vallais. It is so common in Derbyshire as to be called the "Derbyshire neck." It is also common in the valley of the Teme, and the dale of the Corve, N.W. of Ludlow, particularly in the vicinity of the calcareous beds of the Silurian and Devonian formations.

TREATMENT.—Iodine externally. Iodide of potassium internally. Burnt sponge, which contains minute quantities of iodine, was formerly in great repute for the cure of this malady. Removal from the district in which the disease originated.

When other means fail, and the tumour, by its pressure, causes great inconvenience, ligature of the thyroid arteries.

DISEASES OF THE ŒSOPHAGUS.

ŒSOPHAGITIS—INFLAMMATION OF THE ŒSOPHAGUS.

SYMPTOMS.—Pain, or a burning sensation, in the act of swallowing, either in a part of the œsophagus, or through its whole extent. This pain is sometimes increased on pressing the larynx firmly towards the spine. When the inflammation extends to the mucous membrane of the stomach, there is pain in the epigastrium, with vomiting, leading, in some instances, to the expulsion of tenacious casts of the tube. In cases produced by swallowing hot water or corrosive poisons, large flakes of epithelium are often discharged.

CAUSES.—Stimulant and corrosive applications to the tube itself, such as hot water, and the several corrosive poisons. The extension of inflammation from the mouth, fauces, or tonsils; wounds.

TREATMENT.—The frequent use of ice or iced water, and a farinaceous liquid diet. So long as the difficulty of swallowing remains very great, the patient must be supported by nutritious injections. After the first or second week a large well-oiled bougie should be carefully passed daily, in order to prevent constriction during cicatrization.

OTHER DISEASES OF THE ŒSOPHAGUS.

The gullet is subject to other functional and structural diseases, among the former of which may be mentioned rheumatism and spasmodic stricture; among the latter, hypertrophy of the submucous tissue, and various malignant degenerations, such as scirrhus and medullary sarcoma. It is also liable to pressure from aneurism of the aorta or carotid artery, from enlargement of the cervical glands, and from diseases of the spine.

Rheumatism of the gullet is a rare disease, characterised by painful deglutition distinctly referred to some part of its course, accompanied by rheumatism of other muscles, and yielding to the treatment proper to muscular rheumatism.

Spasmodic stricture of the gullet is characterised by difficulty of swallowing, accompanied by a sense of choking, the food either passing into the stomach after many efforts to swallow, or being rejected. It is generally associated with other symptoms of hysteria, and is amenable to the treatment proper to that disease. It is distinguished from organic stricture by the circumstance of its not being constant, but subject to intermissions; by the result of an examination with a bougie; by the history of the case; and the presence of other hysterical symptoms. It requires no local treatment; but in obstinate cases, the daily introduction of a bougie may be attended with benefit.

DISEASES OF THE STOMACH.

Congestion	Of the Stomach.
Hæmatemesis . . .	Vomiting of Blood.
Gastritis	Inflammation of the Stomach.
Ulcer	Of the Stomach.
Perforation	Of the Stomach.
Carcinoma	Of the Stomach.
Other Forms of Stomach Disorder.	

CONGESTION OF THE STOMACH.

Symptoms.—Congestion of a gland entails a diminution of its appropriate secretion. The mucous membrane of the stomach is an extended and highly vascular glandular surface, and when it becomes congested the secretion of gastric juice takes place slowly, and is diminished in quantity. Anorexia, dyspepsia, with a dryish tongue and thirst, and more or less constipation, are therefore the necessary results of congestion.

The distended capillaries are occasionally relieved by an oozing of blood. The effused blood is acted on by the acid secretion of the stomach, and coheres in black coagula, which may be rejected by vomiting, constituting *hæmatemesis;* or the clots undergo disintegration in the stomach, and are rejected as "coffee-ground" or "black" vomit; or they may pass along the alimentary canal, and, after further alteration, be ultimately evacuated as a black grumous or pultaceous stool, constituting *melæna.*

Some pain and tenderness in the epigastrium are generally associated with congestion of the stomach.

Causes.—1. Obstruction to the flow of blood through the liver and thoracic viscera. If a ligature be placed around the portal vein, or the vena cavæ inferior at the under surface of the diaphragm, blood will ooze from the stomach as a necessary consequence. Some diseases of the liver cause so much obstruction to the portal circulation that they are almost tantamount to a ligature so placed; and obstructions to the flow of blood through the lungs and the heart are nearly equivalent in their effects on the stomach to obliteration of the inferior cava above the liver. Hence congestion of the stomach is sooner or later a prominent symptom in cirrhosis of the liver; in atrophy from long-continued obliteration of the bile ducts; and in diseases, such as cancerous tumours, which involve and press upon the portal vein. Acute suppression of bile, as occurs in yellow and relapsing fevers, commonly produces severe congestion of the stomach, resulting in vomiting of altered blood. The disease of the lungs which most frequently leads to congestion of the stomach is emphysema; and disease of the mitral valve, which at the same time contracts its orifice and permits regurgitation, is the condition of the heart which most commonly produces the same result.

Congestion of the stomach may also be due to functional disorder. When the sexual organs fail to perform the menstrual function, the stomach sometimes assumes a vicarious office, and a monthly hæmatemesis takes the place of the catamenia. In some cases this habit is retained during the whole natural term of menstruation.

TREATMENT.—This must be directed to the cause of the disease, and we must relieve the congestion of the portal circulation by free watery purgation induced by the non-irritating saline purgatives, such as potassio-tartrate of soda. The abdominal circulation generally will also be relieved by copious diuresis, to affect which acetate and nitrate of potash may be prescribed. In order to prevent the congestion from degenerating into inflammation and ulceration, irritating food and medicine and strong alcoholic drinks, and even fermented liquors, must be avoided, and the diet must consist chiefly or exclusively of eggs, milk, and farinaceous articles. If there be much pain in the epigastrium, mustard poultices may be applied, and a few leeches to the anus. In cirrhosis of the liver it is better to avoid leeching, for the bleeding is liable to be too free.

Hæmatemesis, if present, must be treated as recommended below.

HÆMATEMESIS—VOMITING OF BLOOD.

SYMPTOMS.—Vomiting of dark-coloured clotted or grumous blood in greater or less quantity, often mixed with food, and preceded by a sense of weight and obtuse pain in the region of the stomach. If the oozing be continuous, the countenance becomes blanched; but if rapid and considerable, the patient becomes pale, faint, and sick, and the vomited blood may be bright-coloured. In hepatic disease the complexion is sallow, and the conjunctiva of the eyes tinged with bile.

CAUSES.—Those of congestion of the stomach; ulcer of the stomach; rupture of an aneurismal tumour into the stomach.

MORBID ANATOMY.—Congestion, ulcers, or malignant disease of the stomach; congestion or chronic disease of the liver.

DIAGNOSIS.—From *hæmoptysis ;* by the rejection of the blood by *vomiting*, not by coughing; by the presence of food; by the discharge of a large quantity of *dark* blood more or less altered. Blood which comes from the lungs, except when discharged from old cavities, is always fluid and of a bright vermilion colour. But in certain rare cases, the diagnosis of the source of the hæmorrhage is not easy. If, for example, an ulcer of the stomach erode a large arterial trunk, the blood rejected from the stomach may be fluid and scarlet. Again, the blood of hæmoptysis may come up into the mouth without the effort of coughing, and may seem to be vomited rather than coughed up. It may also be unmixed with sputa; and when discharged from old cavities of the lungs, may have lost its bright vermilion hue. But the discharge of a very large quantity, such as a pint, or a quart, of dark grumous blood, even though unmixed with food, may be held to be conclusive of its having come from the stomach ; for when such large quantities are expelled from the lungs, the blood is always of a bright vermilion colour. The state of the liver and lungs will serve to confirm the diagnosis.

TREATMENT.—Rest, abstinence from food for some hours, and afterwards a bland farinaceous diet.

When the hæmorrhage is excessive, the patient may be made to drink freely of iced water, or to swallow rough ice, and pounded ice may be applied to the pit of the stomach. The vegetable and mineral astringents (Form. 173). When the hæmorrhage has been stayed, gr. v pilulæ hydrargyri, followed by a saline aperient, should be given, and the disease subsequently treated according to its cause.

If there be suppression of the hæmorrhoidal or catamenial flux, leeches should be applied to the anus or vulva, together with other remedies appropriate to those diseases.

When the disease occurs in delicate or scorbutic habits, tonics and quinine, with the mineral acids, are indicated.

GASTRITIS—INFLAMMATION OF THE STOMACH.

1. ACUTE GASTRITIS.

SYMPTOMS.—An acute fixed pain and sense of burning heat in the pit of the stomach, increased by pressure, deglutition, and the movements of respiration ; frequent vomiting of clear viscid mucus streaked or not with blood, attended with increase of pain ; intense thirst ; great restlessness, and extreme anxiety ; the tongue red ; the pulse quick, small, and hard ; the bowels confined.

The disease generally extends to the gullet and intestines, and is attended by pain and dysphagia, diarrhœa, and abdominal tenderness.

TERMINATIONS.—*In resolution,* when the pulse becomes more soft and full, and the other symptoms gradually disappear. *In chronic* *gastritis*. *In gangrene*, marked by a violent exacerbation of the symptoms, followed by a sudden cessation of pain, a rapid and intermitting pulse, the utmost prostration of strength, cold extremities, delirium, hiccup, and death. *In perforation*, characterised by sudden and acute pain, with extreme prostration, and symptoms of peritonitis.

Causes.—Drinking ardent spirits or hot water; irritant poisons, and indigestible diet. Idiopathic acute gastritis is exceedingly rare. Prolonged abstinence from food. The gouty excitant in the blood.

Diagnosis.—From *enteritis*, by the epigastric heat, tenderness, and pain, and by the more severe vomiting.

Prognosis.—*Favourable*. The pulse becomes softer, fuller, and less frequent; and the pain and tenderness gradually ceases.—*Unfavourable*. No alleviation of symptoms. Extreme and general tenderness of the abdomen. Symptoms marking the accession of gangrene or perforation.

Morbid Anatomy.—The mucous membrane of the stomach red, universally or in patches, especially around the cardia and pylorus; deep redness of the rugæ; abrasion, ulceration, or "hæmorrhagic erosions," occurring as brown or soot-black spots, from the size of a pin's head to that of a pea; or softening of the membrane; gangrene; also dark patches resembling gangrene, but arising from the effusion of blood into the sub-mucous cellular tissue; the blood-vessels full of dark blood. Gangrene and ulceration are rare, but softening is common.

Treatment.—I. The free application of leeches to the anus and pit of the stomach. Iced water or ice, externally and internally. Free action of the bowels in the absence of diarrhœa, by the use of emollient clysters. By the free and frequent use of mucilaginous diluents, such as gruel, linseed-tea, or barley-water.

II. The sickness, restlessness, and pain are best relieved by soda-water and small doses of dilute hydrocyanic acid (♏iii to ♏v) combined with tincture of opium.

2. SUB-ACUTE GASTRITIS—DYSPEPSIA—INDIGESTION.

Symptoms.—Want of appetite; nausea; flatulence; heartburn; occasional pain in the epigastrium; sick headache; a sense of fulness and oppression after eating, or a feeling of languor and depression relieved by taking food. These symptoms, variously combined, and generally accompanied by constipation, diarrhœa, or the two conditions alternately, and with defective or immoderate secretion of bile, constitute the most common form of dyspepsia. A dry cough; cold extremities; headache; furred tongue, with red prominent papillæ; a bitter taste; dimness of vision; bright spots before the eyes; palpitation; shooting or fixed pains in the region of the heart, and under the scapulæ, varying with the degree of flatulence, are occasional consequences of dyspepsia. In the more severe cases the epigastric pain is considerable, and is increased by pressure and by food. Sometimes the least food produces pain, and it is rejected as soon as it is swallowed, or after a short interval. Pain in the stomach (*gastralgia*) may be produced by flatulent distension, and by the presence of hard indigestible food, or of excess of acid. When the pylorus contracts upon masses of hard undigested food as it is passing into the intestines, violent crampy pain in the epigastrium is produced.

CAUSES.—*Predisposing.* Debility; want of exercise; depressing passions; amenorrhœa; imperfect mastication; too short or too long intervals between meals; the abuse of drastic purgatives; close study, or exercise immediately after food; diseases of the liver, pancreas, or spleen; the gouty diathesis. Dyspepsia is a frequent precursor of phthisis, and a common accompaniment of asthma and bronchitis.—*Exciting.* Inactivity of the liver producing constipation; unwholesome and indigestible food; the abuse of spirituous liquors, especially at the dinner-table; liquids in excess, especially hot tea and coffee.

DIAGNOSIS.—From ulcer of the stomach, by the absence of a fixed and limited seat of pain and of hæmatemesis.

TREATMENT.—*Indications.* I. To correct any bad habits, and to regulate the diet. II. To restore the stomach to a healthy condition. III. To palliate urgent symptoms.

The habits which commonly require correction are the following:—Eating too much at one time; eating too often or too seldom; taking too great a variety of food at the same meal; drinking too much liquid before or with the meals; imperfect mastication; resuming bodily or mental occupation directly after eating; indolent and sedentary habits; the injudicious use of purgatives; drinking, smoking, chewing tobacco, opium-eating, and tea and coffee in excess. If any particular article of food seem to disagree, it should be carefully avoided. Flatulence is frequently increased by green vegetables and fruit. Wine and ale will sometimes require to be exchanged for weak brandy and water, or for brandy with soda-water, or Seltzer water.

II. A regular action of the bowels should be brought about by mild cholagogue purgatives. Stomachic tonics, such as gentian, calumba, cascarilla, and cinchona, combined, according to the state of the secretions, with alkalies or the mineral acids, should be persevered in. A few grains of compound rhubarb-pill may be given as a dinner-pill in mild cases.

III. If there be tenderness, half a dozen leeches or a mustard poultice may be applied to the epigastrium. Acidi hydrocyanici diluti, ♏v, tincturæ opii, ♏v, given in effervescence, with a few grains of carbonate of soda and citric acid, will generally allay the vomiting. The diarrhœa will generally yield to a few doses of the pulvis cretæ aromaticus cum opio.

An acute attack of indigestion is best treated by an emetic, followed by rest and a free aloetic purge.

ULCER OF THE STOMACH.

SYMPTOMS.—Pain in the pit of the stomach, referred to a small spot, coming on immediately or soon after food, continuing for an hour or two, and then slowly abating as the stomach becomes empty. A circumscribed soreness in some part of the epigastrium is usually induced by pressure. Circumscribed pain is also commonly felt in the corresponding part of the back. It is increased by indigestible food, hot fluids, and alcoholic liquids, and in young females on the approach of the menstrual period. There is nausea and vomiting of food, of a clear sour liquid, of bile, of blood. Sometimes the blood is discharged by the bowels, which are generally constipated. The patient loses flesh, has an unhealthy aspect, and wears an expression of weariness and suffering. Usually the disease causes very little constitutional disturbance, and in some cases the local symptoms are so slight, that severe hæmatemesis, or even perforation of the stomach, may be the first indication of the disease. In some cases the process of ulceration is rapid, and perforation may occur within a few weeks of the formation of the ulcer. In other cases the ulcer remains open for many years, giving rise to its ordinary symptoms, and now and then to an alarming hæmorrhage; and at last leads to perforation.

TERMINATIONS.—In recovery; in perforation (see p. 504); by hæmorrhage and fatal syncope, or collapse; by marasmus from constant vomiting.

CAUSES.—*Predisposing.* The female sex; intemperance; fatigue; anxiety. The influence of age may be thus briefly stated:—From 16 to 20 years of age, 20 cases; for each decade from 20 to 60, about 50 cases; for the two decades from 60 to 80, about 80 cases; and for the 10 years from 80 to 90, 100 cases. In this country it is supposed to be most frequent in maid-servants, between the age of 18 and that of 25. (Budd.)—*Exciting.* Obscure.

DIAGNOSIS.—From *dyspepsia*, *sub-acute gastritis*, *pyrosis*, and *gastralgia*, by the limited pain on pressure in the epigastrium; by the pain in the back, the more frequent vomiting, and the discharge of blood; from *pyrosis* and from *cancer* of the stomach, by the shorter course of the latter, the marked cancerous diathesis, the lancinating pain, the presence of a hard and moveable tumour in the pit of the stomach, the less abundant hæmorrhage, and the presence of cancer-cells in the vomit. The diagnosis of ulcer of the stomach is often difficult and uncertain.

PROGNOSIS.—Favourable but guarded. Most guarded with young females in whom perforation is a common event. About one in five cases commonly prove fatal in one of the ways mentioned above.

MORBID ANATOMY.—The returns of the hospital at Prague give a total of 10,203 bodies examined, in which 126 open ulcers and 224 cicatrices of the stomach and duodenum, = 3·4 per cent., were found. In more than a third of the cases the ulcer occupies the posterior surface of the stomach; and more than three-fourths occur on the posterior surface, on the lesser curvature, or near the pylorus. In about one-fifth of the cases there is more than one ulcer; and there may be to two, three, four, five, or more. "The ulcer is rarely much smaller than a fourpenny-piece, or larger than a crown-piece;" but it may attain a diameter of five or six inches. Its shape is usually round or oval, and it presents the appearance of "a shallow but level pit, with a sharp, smooth, vertical edge, as though it had been punched out" (Brinton); but as the circular opening in the sub-mucous areolar tissue is smaller, and the aperture in the peritoneum, if the ulcer perforate, still more minute, the ulcer has a conical form. The surrounding mucous membrane and areolar tissue are somewhat thickened, and sometimes inflamed. Perforation takes place in about 1 case in 8; this result being often prevented by adhesion to the pancreas, liver, spleen, mesentery, or diaphragm.

In attributing death to ulceration of the stomach, it is important to be aware of the fact that, under certain circumstances, the coats of the stomach undergo *self-digestion*, resulting in pulpy or gelatinous softening, irregular abrasion, and, ultimately, perforation. The mucous membrane is converted into a thin, pasty mucous layer; the blood-vessels are blackened; and if all the coats of the stomach are removed, a ragged aperture results, through which the contents of the stomach escape. This self-digestion is due to the action of the gastric juice; it is met with in those who have died suddenly during digestion, and in those who have died from disease (such as phthisis), in which chronic irritation of the vagus nerve had induced excessive secretion of gastric juice.

TREATMENT.—I. Our endeavours must be to promote the healing of the ulcer, by preventing irritation or distension of the stomach. With this view the diet must be strictly regulated. Solid food must be rigidly avoided, and its place supplied by milk, eggs in the form of emulsion, light broths, and farinaceous diet, given at short intervals, and in quantities not exceeding a tea-cupful. Spirituous liquors and hot fluids should be forbidden.

II. If there be much *tenderness on pressure*, mustard poultices or blisters should be used; if constant *pain*, solid opium may be given; if *gastrodynia and pyrosis*, nitrate of bismuth; if distressing *vomiting*, hydrocyanic acid, and farinaceous food in very small quantities often repeated; if *vomiting of blood*, small pieces of ice from time to time, and the remedies recommended under hæmatemesis; if *constipation*, castor-oil is the most suitable aperient; if *diarrhœa*, compound kino powder.

III. If the patient be *anæmic*, the preparations of iron, of which the ammonio-citrate is most suitable. (In this disease it may be given dissolved in glycerine.) If there be much debility present, the citrate of iron and quinine in glycerine is to be preferred. In intemperate persons, full doses of opium are indicated.

PERFORATION OF THE STOMACH.

SYMPTOMS.—After a longer or shorter duration of symptoms of ulcer of the stomach, intense pain in the epigastrium occurring suddenly, spreading rapidly over the whole abdomen, and soon followed by tympanites and collapse. The disease assumes all the characters of peritonitis, and usually proves fatal in from twenty-four to thirty-six hours; but in some cases the fatal event is postponed in consequence of the peritonitis being limited in extent, or sub-acute in character. In most cases the rupture takes place during the distension of the stomach by a full meal, but it is sometimes caused by vomiting, straining at stool, coughing, or sneezing; by pressure, shocks, or blows.

TERMINATIONS.—In acute peritonitis and rapid death; in chronic peritonitis, and death after a more considerable interval; in abscess of organs bordering on the stomach, and opening in various ways; in gastric fistula.

CAUSES.—*Predisposing.* Those of the gastric ulcer. Females from the fifteenth to the twenty-fifth year are very liable to this affection.—*Exciting.* Gastric ulcer; irritant poisons.

DIAGNOSIS.—From ordinary peritonitis by the sudden attack.

PROGNOSIS.—In the highest degree unfavourable, especially when the perforation takes place after a full meal.

TREATMENT.—The patient should be placed in the recumbent posture at perfect rest. A full dose of the extract of opium, or the compound soap-pill, should be given at intervals of three or four hours. Complete abstinence from food must be enjoined, the patient being allowed merely to moisten the mouth from time to time. If the inflammation run high, leeches should be applied to the abdomen, followed by warm fomentations. After the lapse of several days, the lower bowel should be relieved by enemata, and nourishment may be supplied by the same channel; but purgatives by the mouth are contra-indicated. Should the patient survive the immediate consequences of the rupture, milk and farinaceous food must be given by the spoonful at short intervals, and a return to the usual diet must be made slowly and cautiously. When convalescent, castor-oil should be used as an aperient.

CARCINOMA, OR CANCER OF THE STOMACH.

SYMPTOMS.—In the early stage the symptoms are very obscure. They are usually those of dyspepsia (sub-acute gastritis). But, after a longer or shorter interval, during which the patient loses flesh, and obtains little or no relief from his dyspeptic symptoms, a circumscribed tumour is discovered in the epigastrium, and now the pain becomes burning, gnawing, or lancinating; and there are nausea; acid and fœtid eructations; with vomiting of ingesta, of mucus, of blood, or of a dark grumous or sour frothy matter containing sarcinæ (Fig. 70); complete constipation, and retraction of the belly, which becomes hard and flat; great emaciation, and the complexion and expression indicative of the cancerous diathesis.

When the cancer involves the pylorus, as is most frequently the case, the passage of food into the intestine is impeded; it accumulates in the stomach, and ferments. The distended stomach is occasionally relieved by copious vomiting.

MORBID ANATOMY.—The disease may take the form of scirrhus, or of medullary or colloid cancer. But the most common form is scirrhus, and its usual seat the pylorus. The disease is identified by the discovery of cancer-cells (Fig. 6, p. 81). The stomach is generally contracted when the disease occupies the cardiac end; greatly expanded and hypertrophied when the pylorus is affected.

DIAGNOSIS.—The epigastric tumour; lancinating pain; constipation and retraction of the abdomen, the cachexy and emaciation; the persistent vomiting of decomposed food, and the rapid progress of the malady, serve to identify this disease. Cancer rarely occurs before forty. The part of the stomach attacked may be generally inferred from the symptoms. When the cardia is affected, the pain and vomiting come on immediately after taking food; when the pylorus is attacked they come on later. If the cardiac orifice be implicated, there will be obstruction to the entrance of food; if the pyloric, obstruction to the exit of chyme.

CAUSES.—*Predisposing.* The cancerous diathesis.—*Exciting.* Chronic dyspepsia.

TREATMENT.—A bland and nourishing diet, such as new milk; milk with arrow-root; strong soups thickened with vermicelli; jellies, and light farinaceous puddings; and tripe boiled in milk. The food should be taken often, and in very small quantities. Excessive acidity may be checked by combining lime-water with the milk, or by the use of bicarbonate of soda. Nutritive enemata may be given once or twice every day; and cod-liver oil rubbed into the abdomen. Narcotics and sedatives to allay pain; leeches, anodyne plasters, fomentations, and embrocations externally; and rest.

OTHER FORMS OF STOMACH DISORDER.

ATONY OF THE STOMACH—ATONIC DYSPEPSIA.

SYMPTOMS.—Anorexia and slowness of digestion, with occasional severe crampy or spasmodic pain some hours after meals, due to the presence of undigested food and its passage through the pylorus. Headache, flushing after meals, and other symptoms of dyspepsia are occasionally associated with this condition.

Cause.—Defective secretion of gastric fluid.

Treatment.—Brisk exercise and the avoidance of sedentary occupations and excessive mental labour and anxiety. A light nutritious diet, taken in small quantities and often. The use of salt, mustard, pepper, a pill composed of gr. v each of mastic or myrrh and extract of rhubarb taken daily half an hour before dinner. Generally a carminative tonic (Form. 263) may be taken with advantage. In many cases the mineral acids are of much service (Form. 137). Small doses of ipecacuanha often do much good.

PYROSIS—WATER-BRASH.

Symptoms.—In the morning or forenoon, when the stomach is empty, or some hours after a meal, pain and tension at the pit of the stomach, lasting some time, and followed by vomiting of a thin watery fluid, in considerable quantity, sometimes acid, but often insipid. The free discharge of this fluid generally relieves the pain, and puts an end to the attack. It may occur only occasionally, or last, with intermission, for years. The fluid, which may vary from an ounce to a pint or more, is rejected by a sort of rumination and not by vomiting ordinary.

Causes.—*Predisposing.* Middle age. The female sex.—*Exciting.* Reflex irritation of the abdominal and pelvic viscera, especially the uterus. Hence pyrosis frequently accompanies pregnancy. A poor diet.

Treatment.—Improve the diet, and avoid an undue proportion of farinaceous substances. If the liquor ejected from the stomach be highly acid, alkalies (Form. 138, 166, or 282). Bismuth (Form. 85) is a very useful remedy. In other cases the vegetable astringents in combination with opium, such as gr. x pulvis kino compositi, are of much service.

EXCESSIVE FORMATION OF LACTIC ACID IN THE STOMACH.

Symptoms and Treatment.—"This disorder is most common in nervous persons with feeble digestion, in whom it not unfrequently happens that acid collects in great quantities after meals. They often familiarly tell us that almost everything they eat turns to an acid." (Budd.) Severe heartburn comes on soon after eating, and is occasionally relieved after two or three hours by vomiting of very sour fluid, the acidity being due to lactic acid produced by conversion of the starchy constituents of food into that compound. The alkalies afford temporary relief; and the mineral acids more lasting benefit.

FORMATION OF ACETIC ACID BY FERMENTATION OF THE SACCHARINE CONSTITUENTS OF THE FOOD.

Symptoms and Treatment.—Heartburn (pain in the stomach and sour eructations) after meals; belching; and eventually vomiting of sour frothy fluid containing much acetic acid with or without a little alcohol, are the symptoms of this disorder. Very frequently it is associated with the development of the peculiar vegetable organisms which have been called by Mr. Goodsir *Sarcinæ ventriculi* (Fig. 70). The sarcinæ are found in a brownish scum on the surface of the vomited matters. They are often associated with the common yeast fungus, *Torula cerevisia* (Fig. 25, p. 133).

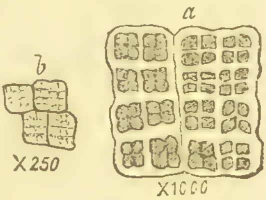


Fig. 70.

This form of stomach disease is often very obstinate, and may continue, with greater or less severity, for years. Alkalies only give temporary relief. The fermentative process may be prevented by kreasote given in ii or iii ♏ doses in the form of pill, thrice a day. Sulphurous acid is still more effectual; it may be given in ʒss doses diluted with a little peppermint-water twice or thrice a day.

SYMPATHETIC VOMITING.

Causes.—Sympathetic disorder of the stomach resulting in vomiting may be produced by irritation of the brain, of the lungs, liver, intestines, kidneys, and ureters, uterus and ovaries. Cerebral and uterine irritation are most prone to induce it, as is well illustrated in cerebral concussion and in pregnancy.

When the irritation is prolonged reflex vomiting may become a constant and distressing symptom. This frequently happens in the latter stage of tubercular disease of the lungs; constant irritation reflected on the stomach leading to the secretion of much sour fluid.

The treatment must of course be directed to the removal of the source of the irritation. In the vomiting associated with phthisis, the alkalies and subnitrate of bismuth, combined with hydrocyanic acid and the vegetable astringents, are of much service. In other cases, such as the passage of a gall-stone, large doses of opium, in the solid form, may be required.

DISEASES OF THE INTESTINES.

Enteritis	Inflammation of the Intestines.
Dysenteria	Dysentery.
Diarrhœa	Looseness of the Bowels.
Melæna	Hæmorrhage from the Bowels.
Torpor Intestinorum	Constipation.
Obstructio Intestinorum	Obstruction of the Bowels.
Intus-susceptio	Invagination of the Bowels.
Colica	Colic.
Colica Pictonum	Painters' Colic.
Tympanites	Drum Belly.
Hæmorrhoides	Piles.

ENTERITIS.

Definition.—Inflammation of the mucous membrane of the small intestine.

1. GENERAL ENTERITIS.

Synonyms.—*Enteria. Enteritis erythemoidea. Diarrhœa mucosa*, or *catarrhosa*.

Symptoms.—At first chilliness or slight rigor; nausea, and if the duodenum be especially affected, vomiting; thirst; a white furred tongue, with prominent papillæ, and a red tip; heat and soreness in the belly, but chiefly about the epigastrium and umbilicus; a dull diffused pain on pressure; and frequent diarrhœa. The nature of the evacuations depend on the cause of irritation. They are always fluid: at first they contain much undigested matter; subsequently they are chiefly composed of watery mucus, occasionally streaked with blood. After the diarrhœa has continued for some hours, the intestine is liable to become distended with flatus, producing gurgling and griping pain.

There is anorexia: and if much fluid, or a small portion of solid food be taken, it either induces vomiting, or, after a time, produces griping pain and increased diarrhœa. Unless the patient be subjected to judicious treatment, these symptoms may continue for several days, or even for weeks, and his health becomes much impaired.

Causes.—Imperfect stomach digestion; the passage of vitiated or imperfectly formed chyme into the intestine. A vitiated condition of the bile. Drastic purgatives:—the symptoms of enteritis may be well studied in the effects produced by a large dose of jalap. Mineral poisons, such as arsenic, antimony, and corrosive sublimate. Exposure to external cold, causing congestion of the internal organs.

Treatment.—Warmth to the external surface; rest, functional and mechanical, of the inflamed part, by quietude of body, light diet such as may be digested in the stomach, or, if passed into the intestine, cannot irritate the inflamed surface. Eggs, milk, beef-tea, arrowroot, constitute such articles of diet. Milk, arrowroot, mixed, if depression require it, with a little brandy, is generally the most appropriate food. The inflammation and its most prominent symptom, diarrhœa, will be relieved by Form. 85, 165, 175. Hot fomentations, or stimulant poultices, may be simultaneously applied to the abdomen. If the diarrhœa persist, and the evacuations be bloody, it will be necessary to administer mineral astringents (Form. 151, 176).

2. PARTIAL ENTERITIS.

Partial enteritis is caused by specific inflammation of the glands of the small intestine. The solitary and agminated glands are invariably affected in enteric fever; the attendant symptoms are recorded at page 298. They also frequently become the seat of tubercular deposit, inducing local inflammation and subsequent ulceration. The symptoms of tubercular ulceration of the small intestine, generally speaking, are those of well-marked ulceration in enteric fever, viz., persistent purging, light-coloured watery stools, griping pain in the abdomen, gurgling and tenderness about the right iliac fossa. In both diseases hæmorrhage to an alarming extent is liable to occur. The general treatment is in both diseases alike. Bismuth is very serviceable in the diarrhœa of phthisis (Form. 85).

Morbid Anatomy.—Of the ulceration of enteric fever (see page 298). Of tubercular ulceration of the intestine:—Large patches of ulceration throughout the ileum, separated by intervals of four or six inches, commencing as small round discrete ulcers at the upper part of the canal, gradually becoming confluent below into large irregular patches, extending round the whole circumference of the canal. From a description of a single ulcer the appearance of all may be inferred. Ulcer irregularly circular, limited by a thick and elevated rounded angry-looking border; within, the margin is irregular and continuous, with coarse angry-looking more or less discrete granulations, between which little yellow masses of tubercular deposit, firmly attached to the base of the ulcer, are here and there seen; the contiguous parts of the intestinal wall much thickened, so that on spreading the ulcerated bowel on a flat surface, the patches form considerable elevations. Some of the ulcers extend quite down to the peritoneal coat. Their position is known before opening the intestine by corresponding vascularity of the peritoneum, and a feeling of irregular thickening.

DYSENTERIA—COLITIS—DYSENTERY—BLOODY FLUX.

Definition.—A specific inflammation of the mucous membrane of the colon, accompanied by tenesmus, and mucous, bloody, or purulent stools.

Symptoms.—At first cold shiverings, followed by fever; or bilious diarrhœa, which, after continuing for a few days, without causing much pain or uneasiness, becomes an incessant flux, with discharge of pure blood, of mucus, or of a white glairy matter, like white of egg, mixed with blood. Masses of indurated fæces often form part of the discharges. At the same time, there are severe griping pains in the abdomen; frequent inclination to go to stool; tenesmus; dysuria; and cramps in the thighs. The patient is restless, sleepless, and anxious. The pulse is quick and hard, the tongue clean, the skin warm and moist, the face flushed, and the eye bright.

In this, the first stage of dysentery, the disease sometimes proves fatal by collapse; but it more commonly assumes the chronic form, the purging becomes persistent, pus and blood appear in variable quantity in the stools, which are semifluid and pultaceous, mixed with shreds of lymph, and excessively offensive.

Under appropriate treatment the blood and pus disappear, the motions look more healthy, the diarrhœa decreases, and after some months the patient recovers. But recovery is in many cases very much protracted, and in many more it is incomplete, and the purging sets in again and again on exposure to cold, or after improper food. The patient preserves a good appetite, and does not lose flesh; but if, as is sometimes the case, the disease involve the ileum also, emaciation, in proportion to the extent of the disease, results.

COMPLICATIONS.—The disease may accompany, precede, or follow ague, or remittent fever; and may be complicated with inflammation of the liver, spleen, or pancreas.

TERMINATIONS.—In incessant vomiting; in aphthous inflammation of the mouth; in abscess of the liver; in ascites; in fatal hæmorrhage; in perforation of the intestine; in gangrene; in collapse.

MORBID ANATOMY.—In the *acute stage*, the mucous membrane of the colon inflamed in patches of a deep-red colour, or throughout its whole extent; sometimes black, as if gangrenous; sometimes softened. The intestine itself contracted. The follicles enlarged and transparent, or hard and opaque. In the *advanced stage* of the disease, ulcers, which commence, in the first instance, in the solitary glands, and thence spread into small round ulcers, and subsequently (becoming confluent) into large ragged patches. The neighbouring tissues are much thickened. In some cases, similar appearances in the lower part of the small intestines, and occasionally even in the stomach. The mesenteric glands often red, swollen, and soft. The intestines, in the early stage, contain mucus, blood, and a watery lymph; in the advanced stages, pus mixed with blood.

In cases of long-standing disease the ulcers are found contracted and surrounded by tissue of almost cartilaginous hardness. Tough cicatrices mark the position of ulcers which have ultimately healed.

A large majority of the fatal cases of dysentery present abscess in the liver. The purulent deposits in this organ may be due to concomitant hepatitis, or (as Dr. Budd has suggested) the pus may be derived from the ulcerated intestine (see Pyæmia).

Causes.—*Predisposing.* A high temperature. Unwholesome food, especially salt meat and unripe fruit; fatigue, privation, and exposure. Intemperance.—*Exciting.* Marsh miasma; impure water; exposure to wet and cold, especially at night after a hot day. A debauch.

Duration.—From a few days to several weeks, months, or years.

Mortality.—In acute dysentery from 1 in 8 to 1 in 50; in chronic dysentery, from 1 in 4 to 1 in 6.

Diagnosis.—From inflammation and ulceration of the small intestines; by the absence of anorexia, vomiting, and emaciation. From ordinary diarrhœa by the presence of sloughy membrane and pus, and by the persistence of the purging.

Prognosis.—*Favourable.* Moderate diarrhœa, and the absence of hectic.

Unfavourable.—Violent and distressing tenesmus and tormina; vomiting; hiccup; cold extremities; cold and partial sweats; the tongue preternaturally red and dry; great prostration; the motions extremely fœtid; petechiæ; involuntary evacuations; intermitting pulse; complications with diseases of the liver, and intermittent or remittent fevers.

Treatment.—In the *acute stage.* The hot bath; leeches to the anus or to the tender spots of the abdomen, followed by hot fomentations, turpentine stupes, or mustard poultices. Opium in the solid form, or Dover's powder, combined with small doses of calomel, blue pill, or hydrarg. c̄ cretâ (Form. 329), every one, two, or three hours, according to the severity of the symptoms, and followed at intervals by an ounce of castor-oil. Opiate enemata or suppositoria. The strength should be supported by light preparations of barley, rice, sago, arrowroot, flour, panada, and gelatinous broth; solid food being proscribed.

Local blood-letting is rarely required in this country; a full dose of castor-oil, with ten or twenty drops of laudanum, and a regulated diet, being generally sufficient.

As the evidence bearing on the treatment of dysentery is very conflicting, it will be allowable to prescribe a treatment founded on the nature of the disease. The first object to be accomplished is the removal of the solid contents of the bowels by full and free doses of castor-oil combined with from ♏ xx-xxx of tincturæ opii. Two or three such doses might be given with advantage, on successive mornings. At the same time a diet should be prescribed free from solid ingredients, but more or less nourishing according to the state of the patient, with an allowance of port wine in cases of great debility. Tender spots in the abdomen should be treated with a few leeches, followed by warm fomentations: and tenesmus and dysuria by suppositories of the compound soap-pill, or small injections of gruel, containing laudanum. From the favourable effect of nitrate of potash in doses of ten grains frequently repeated in a very troublesome and intractable form of diarrhœa, I should be disposed to recommend ten grains of this salt with a grain of opium and a grain of ipecacuanha three or four times a day. (G.)

Chronic dysentery is one of the most intractable of diseases; a fact explained by the pathological condition of the diseased intestine. Alterations in the calibre of the intestine and the passage of undigested food, or of irritating fluids, are sufficient to prevent the ulcers from healing. The diet must therefore consist of bread, eggs, and milk; and such other food as will leave no indigestible residue. Vegetables must be strictly prohibited.

The diarrhœa will only yield to the mineral astringents, of which sulphate of copper, in ½ grain doses combined with ¼ of powdered opium, is the most effectual.

The bowels should be washed out every day with a cold-water clyster.

PROPHYLAXIS.—Warm and dry clothing; cleanliness; a mixed and wholesome diet; avoidance of exposure to wet, cold, and fatigue; prompt change of wet clothing. In the case of armies, a frequent change of the site of the camp.

REMEDIES.—Emetics; ipecacuanha in small and repeated doses; large doses of opium (xx grs. in twenty-four hours); acetate of lead with opium; injections of iced water, turpentine; quinine; salicine (in five-grain doses); decoction of cusparia, combined with nitric acid and laudanum; strychnia. In chronic cases, injections of nitrate of silver, sulphate of copper, or acetate of lead.

DIARRHŒA—LOOSENESS, OR PURGING.

DEFINITION.—Frequent discharges of semi-solid, or fluid stools, with more or less gastro-intestinal irritation.

VARIETIES.—1. Intestinal dyspepsia. 2. Bilious diarrhœa. 3. Mucous diarrhœa. 4. Serous diarrhœa. 5. Diarrhœa with fibrinous exsudation. 6. Sympathetic diarrhœa.

The *first form* is very common in the autumn and latter part of summer. It is produced by the ingestion of fruits. In this country, green peas and cucumbers are the most frequent cause of diarrhœa. The treatment consists in the removal of the offending matter by a full dose of castor-oil, combined, if there be much griping, with ♏x or xv of tincture of opium.

Bilious diarrhœa is very common in the European inhabitants of tropical climates. It is caused by use of a larger quantity of animal food than is required in hot climates, under which circumstances the diminished respiratory function is compensated by the elimination of the hydro-carbonaceous constituents of the bile in excessive quantities. (See Biliary Congestion.) The secretion is rapidly poured out into the duodenum, and sets up bilious diarrhœa.

The treatment consists:—1. In relieving the distended condition of the liver, by allowing the diarrhœa to continue unchecked for a time. If there be pain, gr. xv–xx of bicarbonate of soda may be given in combination with ♏v–x of tincture of opium.—2. By adapting the diet to the altered conditions of existence, and substituting vegetable for animal food, and avoiding the use of spirituous liquors.

Mucous diarrhœa, or intestinal catarrh, is a common variety. It sometimes co-exists with, and sometimes follows upon catarrh of the bronchial mucous membrane. The slightest exposure to cold and damp will induce it in many delicate people. It is this form of diarrhœa which accompanies enteritis and the acute stage of dysentery.

The appropriate remedies are sulphuric acid, and the vegetable astringents, such as catechu and gallic acid, together with the general treatment recommended in enteritis.

Serous or watery diarrhœa often occurs spontaneously in ascites and general dropsy, in which conditions it appears to be a natural curative process, caused by the direct exsudation of the watery constituents of the blood from the congested membrane. It should therefore be encouraged, and only controlled when excessive by the vegetable astringents. This form of diarrhœa follows the administration of the hydragogue purgatives. Sometimes it alternates with profuse perspiration, as in colliquative diarrhœa. In Asiatic cholera it occurs to an intense degree.

Fibrinous diarrhœa is very rare. The discharges, in the form of shreds or tubular membranes, resemble those of croup, or of plastic bronchitis. In the treatment the astringent mineral salts are very serviceable.

Sympathetic diarrhœa.—In place of morning sickness, many women experience diarrhœa during the early months of pregnancy. It frequently occurs in children during teething; emotional excitement quickly induces it in persons of the nervous temperament. It readily yields to small doses of opium.

From the foregoing it appears that there is no single treatment for diarrhœa. Before prescribing remedies we ought, from the previous history, or from the nature of the evacuations, to determine the precise cause.

CAUSES.—Cold applied to the surface; suppressed perspiration; mental emotions; pregnancy; teething; the heat of the summer and autumn seasons; indigestible food; unripe fruits, or ripe fruits in excess; putrid substances; the abuse of active purgatives; previous constipation; worms; retrocedent gout or rheumatism; phthisis; enteric fever. Diarrhœa is a frequent precursor of Asiatic cholera.

MELÆNA—HÆMORRHAGE FROM THE BOWELS.

DEFINITION.—The discharge of dark-coloured, or more or less altered, blood from the bowels.

CAUSES.—Melæna is symptomatic of diseases of the liver, heart, and lungs, obstructing the general venous and portal circulations (see Hæmatemesis, page 498); ulcer of the stomach, or duodenum; tubercular ulceration of the small intestine; enteric fever; dysentery; intussusception; rupture of an aneurismal sac into the bowel.

Diagnosis.—From *hæmorrhoids* by the darker colour and larger quantity of the blood, and by the absence of soreness and tenesmus.

Treatment.—That of the condition producing it. (See the several diseases above enumerated.)

TORPOR INTESTINORUM—CONSTIPATION.

The causes of constipation are either structural or functional.

The *structural* causes either narrow the intestines or obliterate the passage. In the one case, purgative medicines act with difficulty; in the other case, action of the bowels is impossible.

Among the *functional* causes of constipation, are the absence of irritating matter from the diet, a deficiency of bile, want of proper exercise, spasmodic action or paralysis of some part of the gut.

The *treatment* of constipation, due to alteration of function, will depend on the character of that alteration. If the food be deficient in indigestible matter, we must supply it by brown bread or ripe fruits; if the bile be wanting, we must stimulate the secretions of the liver by mercurial preparations in small doses; if the habits be sedentary, we must enjoin proper exercise. The other functional disorders will be noticed under the head of Colic.

Habitual constipation is best treated by rhubarb in powder or infusion (Form. 263, 282). When the torpor of the bowels is still greater, and especially where there is a large accumulation of hardened fæces, purgative enemata are required (see Formulæ 291); aided by castor-oil by the mouth.

A stream of cold water poured from a height on the abdomen has sometimes relieved obstinate constipation. Electricity is serviceable in some cases, one of the conductors being inserted within the rectum.

OBSTRUCTION OF THE BOWELS.

It sometimes happens that all our remedies fail to relieve the bowels. If in such a case there be tenderness in any particular part of the abdomen, accompanied by vomiting, we may be sure that there is obstruction, more or less complete, to the passage of fæcal matter, and it becomes a matter of the most urgent necessity to ascertain the cause and situation of the obstruction. The causes are:—

1. Strangulation or incarceration of a portion of intestine: a small knuckle of intestine may, after careful examination, be found at the

femoral opening, or in the scrotum or labium, and no other symptom of hernia but constipation be present. The strangulation may be internal, and caused either by intussusception, or by the entanglement of a portion of intestine in a band of the mesentery or in some old adhesion.

2. Fæcal accumulations, forming large, hard, dry masses, filling up the cells of the colon, are liable to form round biliary calculi, cherry and plum stones, and other foreign bodies. These accumulations feel like hard, irregular tumours, and may be mistaken for adventitious growths. Fæcal accumulations are very apt to form in the cæcum, where they often set up violent inflammation, with symptoms of complete obstruction. If the inflammatory symptoms be not subdued, pelvic abscess and perforation are very liable to result. The inflamed cæcum sometimes becomes adherent to the anterior abdominal wall, an abscess forms and points, and at length pus and fæcal matter discharges through an opening communicating with the interior of the intestine.

3. Cancerous growths, chiefly of the rectum; and cicatrized ulcers of the bowel, are other causes of obstruction.

TREATMENT.—Reduce the hernia, and give a copious clyster of gruel. If the strangulation be internal, and the symptoms urgent, a careful diagnosis of the exact seat of strangulation should be made; the abdomen should be opened without delay, and the bowel disengaged. If the obstruction be due to accumulation in the cæcum and large intestines, large castor-oil or soap enemata should be thrown up, and hot fomentations simultaneously applied to the abdomen. If there be symptoms of inflammation, leeches must be freely applied over the inflamed part. The vomiting may be allayed by iced soda-water, and the pain by large doses of opium. When the scybala reach the rectum, it may be necessary to assist their discharge by a forceps or scoop. In cases of unrelieved obstruction, perforation is liable to occur.

The symptoms and treatment of PERFORATION OF THE INTESTINES are the same as those of the stomach. (See page 504.)

INTUS-SUSCEPTIO—INVAGINATION.

SYMPTOMS.—During the violent action of strong purgatives, or after severe colic, a constant desire to go to stool, violent tormina and tenesmus, discharge of blood, or of scanty bloody mucus, and the symptoms of enteritis. These symptoms are not decisive, but the existence of the disease becomes more probable after the failure of attempts to evacuate the bowels, and the supervention of hiccup and stercoraceous vomiting.

MORBID ANATOMY.—One portion (from a few lines to more than a foot in length) of the intestines enclosed within another. In most cases there is only one of these invaginations, but in some instances there are several. The most common seat of the obstruction is the junction of the small and large intestines; but it may take place in any part of the small intestines, and in the arch of the colon. A natural cure is sometimes effected by adhesion, suppuration, gangrene, and separation of the enclosed portion of intestine, the presence of which may be looked for in the stools.

DIAGNOSIS.—Sudden obstruction of the bowels, followed by a perceptible tumour in the abdomen, and the passage of blood, would give reason for suspecting the existence of this disease. The discovery of a portion of the intestinal tube in the stools would furnish conclusive evidence.

PROGNOSIS.—Very unfavourable. In a few cases recovery takes place after sloughing of the constricted portion of intestine.

TREATMENT.—I. If there be marked tenderness in any part of the abdomen, leeches must be applied to the spot, followed by warm poultices, or hot fomentations.

II. The distressing vomiting is best relieved by iced soda-water. Solid opium, or its tincture, should also be given at short intervals, so as to moderate the pain and control the disordered peristaltic action.

III. To relieve the obstruction, a large quantity of warm water should be thrown up into the bowels by the long elastic tube; if this should fail, air may be injected. This treatment may be repeated at intervals, till the bowels are relieved, or till such attempts at relief seem hopeless. After the failure of all these attempts, the mechanical remedies recommended for removing the obstruction may be resorted to; or the sac of the peritoneum may be opened, and the intestine unravelled.

COLICA—COLIC.

DEFINITION.—Painful contraction and disordered peristaltic action of the intestines, from the presence of hard fæces or air in the intestines.

SYMPTOMS.—Severe twisting pain in the abdomen, occurring in paroxysms, with retraction of the umbilicus and troublesome flatulence. The pain is relieved by pressure; the pulse is little, if at all, increased in frequency.

CAUSES.—The presence of undigested hard substances, such as unripe fruit and uncooked vegetables in the intestines; hardened fæces (scybala), or other accumulations; flatulent distension; obstruction of some part of the intestinal canal from impacted fæces; stricture, or strangulation; worms; certain metallic poisons; *e.g.*, lead.

DIAGNOSIS.—From *peritonitis*, by the peculiar twisting pain and retraction of the navel; by the absence of fever; and by the pain being alleviated by pressure.

Rheumatism of the abdominal muscles is distinguished at page 356.

Treatment.—Having ascertained that there is no concomitant inflammation, and no mechanical obstruction detectable, and, at the same time, that the pain is not merely muscular—the bowels, if there have been defective action, should be freely relieved by a full dose of castor-oil with ♏x to ♏xv of tincture of opium.

If the colic be due merely to flatulent distension give ʒj spiritus chloroformi, with ℥ss tincturæ rhei co., and ♏x tincturæ opii.

If there be symptoms of obstruction, we must avoid active purgatives, and trust to enemata. A large clyster of thin gruel containing a drachm of the tincture of opium may be thrown up, either by means of the common clyster-pipe or through the flexible tube. Should the bowels continue unrelieved, and there are still no symptoms of inflammation, the patient should be kept under the influence of opium till a free evacuation takes place. Meanwhile, the pain may be relieved by applying flannels wrung out of hot water or the poppy fomentation; or by steady pressure.

It is not unusual in cases of colic to find, on inquiry, that one of the first symptoms was the discharge of a quantity of gelatinous mucus from the bowels. In such cases there is commonly more or less tenderness in some part of the abdomen, especially in the right iliac fossa, and from six to twelve leeches, followed by a warm bread-and-water poultice, should be applied to the tender spot. (G.)

Flatulence may be relieved by the introduction of the long flexible tube, which may also be used to convey warm water into the gut.

In spite of the persevering employment of these means, six or seven days will sometimes elapse before the bowels can be made to act.

COLICA PICTONUM—LEAD COLIC.

Synonyms.—Colic of Poictou. Painters' colic. Devonshire colic.

Symptoms.—Those of colic from other causes, the pain generally coming on more gradually, and being often accompanied with pains in the limbs, or with weakness, or complete paralysis of the hands or forearms. The abdomen is generally retracted.

Diagnosis.—From common colic, by the history of the case and the employment of the patient; and generally by the blue line along the margin of the gums indicating the action of lead on the system.

Prognosis.—Favourable. Five fatal cases in 500. (Andral.)

Treatment.—Sulphated aperients (Form. 264); enemata of warm water; hot fomentations or the warm bath.

Prophylaxis. (See Lead Palsy, p. 399.)

TYMPANITES—METEORISMUS—DRUM BELLY.

Symptoms.—The abdomen distended, tense, elastic, and painful, and sounding, on percussion, like a drum. The air is, in almost all cases, contained in the stomach and intestines, its most common seat being the arch and sigmoid flexure of the colon. In very rare instances air passes into the sac of the peritoneum, in consequence of ulceration of the bowels. Tympanites is a painful symptom in severe cases of enteric fever, and in the latter stages of peritonitis.

Causes.—Loss of tone in the intestinal canal; indigestible food; abuse of purgatives; hysteria.

Diagnosis. — From *ascites*, by the clear sound and absence of fluctuation.

Treatment.—In mild cases of flatulent distension of the bowels, the remedies usually resorted to are essence of ginger with hot water, or brandy and water swallowed as hot as it can be readily borne. In severe cases large doses of opium with ʒj of spirit of chloroform, or iii–v drops of cajeput oil may be necessary. If the distension be very great it may often be relieved by the passage of a long wide elastic tube into the bowel. Stimulant enemata (Form. 72) often give great relief.

The use of food known to occasion flatulence should be carefully avoided.

HÆMORRHOIDES—THE PILES.

1. EXTERNAL PILES.

Definition.—Small round tumours, situated at the verge of the anus, and covered with skin or mucous membrane, or painful folds of integument. The tumours either discharge blood, when they are called *bleeding piles*, or they do not bleed, when they are called *blind piles*. When free from pain they are called *indolent*.

Symptoms.—When piles are in an inflamed state they occasion heat, itching, and pain, with a sense of weight and tension, increased upon going to stool, which generally occasions a discharge of blood. The inflammation sometimes runs on to suppuration. In mild cases piles appear and disappear, and are often absent for long periods of time.

2. INTERNAL PILES.

Symptoms.—A sensation as of a foreign body in the rectum, with frequent desire to relieve the bowels, and painful strainings, accompanied by discharges of blood. In the more severe cases, dysuria, pain in the back and down the thighs, and, in females, uterine irritation.

Causes.—Luxurious and sedentary habits; habitual costiveness;

plethora; hard riding; excesses of various kinds; the suppression of some habitual discharge; the frequent use of strong aloetic purgatives; varicose condition of the hæmorrhoidal veins; pregnancy.

Prognosis.—The discharge of blood by piles is often salutary, especially in persons advanced in life, and their suppression may be followed by more serious hæmorrhage, such as apoplexy.

Treatment.—I. *General.* II. *Local.*

I. The circulation of blood through the abdominal vessels must be promoted, and the regular action of the bowels maintained. To effect this, we must enjoin activity and abstemious living. The most suitable aperients are those prescribed in Form. 282 and 286, or simply confection of senna.

II. The *local* treatment consists in the strict observance of cleanliness, washing with cold water after each motion, and the careful return of the piles, if, being internal, they protrude during the evacuation of the bowels; in the use of astringent washes or ointments (such as the liq. plumbi subacetat., the unguentum gallæ cum opio). When the piles are inflamed, the application of leeches, followed by cooling lotions.

Bleeding piles also require the use of cold astringent applications and injections. Daily injections of cold water are highly beneficial. When the hæmorrhage is profuse, astringents may be given internally. The best is the perchloride of iron. The hæmorrhage, when very profuse, must be treated by astringent injections of alum and tannic acid.

Piles, strangulated by the spasm of the sphincter, must be compressed with the finger and passed back; the operation being facilitated by the use of the warm bath. A T bandage may become necessary.

When the tumours become chronic they should be removed.

Prophylaxis.—Patients affected with piles should sit and ride as little as possible, and pursue their avocations, if inactive or literary, in an erect posture.

DISEASES OF THE STOMACH AND INTESTINES.

Gastro-Enteritis Mucosa . .	English Cholera.
Cholera Maligna	Malignant Cholera.

GASTRO-ENTERITIS MUCOSA—ENGLISH CHOLERA.

Symptoms.—Nausea, pain, and distension of the stomach and intestines, succeeded by vomiting, and by purging of bilious or feculent matter, and, when this has been discharged, of mucus. The tongue is furred; the pulse is frequent, small, and sometimes unequal; and there is much thirst. In rare cases death takes place within the space of twenty-four hours, after hiccup, cold sweats, great anxiety, blueness of the surface, and painful cramps of the extremities.

Causes.—Excessive heat, or sudden transitions from heat to cold; the summer and autumnal seasons; indigestible food; unripe fruit, or an excessive quantity of ripe fruit; putrid meat; decayed vegetables; violent purgatives; irritant poisons; catarrh.

Diagnosis.—From enteritis by the co-existence of gastric symptoms. The disease in its most severe form is not distinguishable from Asiatic cholera.

Prognosis.—*Favourable.* Cessation of the vomiting, tendency to sleep, warmth and moisture of the skin. The disease, when protracted to the third or fourth day, seldom proves fatal.—*Unfavourable.* Painful cramps of the extremities; convulsions; great prostration; cold, clammy sweats; anxiety; short hurried respiration; continual hiccup; intermitting pulse.

Treatment.—A farinaceous diet, and the entire exclusion of solid food. A scruple of the compound chalk and opium powder, or a mucilaginous mixture, with twenty drops of tincture of hyoscyamus, may be given three or four times a day. When there is great prostration of strength, full doses of opium, with stimulants, are indicated, with warmth to the surface, and mustard sinapisms to the extremities.

When the disease has subsided, the usual diet must be gradually resumed, and tonic medicines given if there be much debility.

CHOLERA MALIGNA—MALIGNANT CHOLERA.

Synonyms.—Cholera morbus; epidemic, spasmodic, Indian, Asiatic, blue, and pestilential cholera. Cholerine—a diminutive term. Cholera asphyxia—a term indicative of the state of collapse in fatal cases.

Definition.—An epidemic malady due to impure food and water, characterised by profuse vomiting and purging with symptoms of collapse allied to asphyxia.

Symptoms.—In a few cases (rarely seen out of India), the attack is sudden; the patient vomits once or twice, or passes one or two loose motions, complains of giddiness, blindness, or deafness, falls down, and expires in a few minutes. In another and larger class of cases the disease shows itself after two or three days of slight indisposition, with depression of spirits, loss of appetite, oppression at the præcordia, rumbling in the bowels, giddiness, noises in the ears, and twitchings in the limbs. In a still larger class the fully-formed disease sets in after a preliminary attack of diarrhœa of some hours' or days' continuance.

In the majority of cases, both in India and in England, the following is the order of the symptoms: after a preliminary attack of diarrhœa, of greater or less severity, and lasting for some hours or days, the patient is seized with symptoms of collapse, accompanied, in most cases, by vomiting. The acts of vomiting and purging are generally unattended by pain or tenderness in the abdomen; and the matters rejected from the stomach and bowels are free from bile and colourless, have a faint fishy smell, and resemble yeast; or they consist of a thin colourless serum, or bear a close resemblance to rice-water, being familiarly known as "*rice-water evacuations.*" Sometimes they have a pink colour, or the deeper hue of port wine. Severe and painful cramps commence in the fingers and toes, and rapidly extend to the calves of the legs, to the thighs, and muscles of the abdomen; the eyes are sunk, and surrounded by a dark circle; the features contracted and sharpened; the expression of countenance indifferent and apathetic; the face, extremities, and sometimes the whole surface of the body, assume a leaden, bluish, or purple hue; the limbs are shrunken and contracted; the nails blue; the hands clammy and sodden; the surface covered with a profuse cold sweat; the pulse thready or imperceptible at the wrist, arm, axilla, temple, and neck; and if a vein or artery be opened, the blood trickles away, thick and dark. In spite of the extreme coldness of the surface, the patient complains of heat, throws off the bedclothes, and suffers from great restlessness and incessant jactitation, complains of a burning heat in the epigastrium, and is tormented with thirst; the respirations are below the number in health, the inspiration difficult, and the expiration short and convulsive; the voice is plaintive, the patient speaking in a hoarse whisper; the breath feels cold; the tongue is white, or of a leaden colour, cold and flabby; the temperature often as low as 79° or 77°, and even 72°. The secretion of urine is partially or entirely suppressed, and the body exhales an earthy or cadaverous odour. In this state of collapse the disease often proves fatal, the patient dying without a struggle, and retaining his faculties to the last. In other cases he gradually rallies, the pulse rises, the blueness of the surface disappears, the body resumes its warmth, the cramps and vomiting cease, bile appears in the motions, the secretion of urine is restored, and a rapid and complete recovery takes place. But in a third class of cases the improvement is partial and temporary, and the patient falls into the typhous condition from which he may possibly recover after several days.

TERMINATIONS.—In sudden death; in death after severe primary or secondary symptoms; in recovery; in prolonged gastric irritation; in secondary fever, of the typhous character, and often accompanied by a rash resembling urticaria febrilis.

PATHOLOGY AND MORBID ANATOMY.—The disease appears to consist in a sudden rejection of the fluid parts of the blood through the muccus membrane of the alimentary canal; the intestines are filled with a white flaky liquid; the mucous membrane is swollen, and greatly congested in patches; all the glands of the intestines are large and prominent; the veins and arteries loaded with dark blood; the lungs congested in some cases, extremely contracted in others; the liver and gall-bladder gorged with bile; the kidneys congested; the urinary bladder contracted and empty. In patients who survive the stage of collapse, and die after the secondary fever, the morbid appearances are those present in typhus.

DURATION.—In fatal cases, from a few minutes to twelve hours or more. More than half the fatal cases die within twenty-four, and nearly a sixth within six, hours. The average duration is about two days. The duration of the cold stage varies from a few minutes to forty-eight hours or more, while that of the febrile stage may extend from four to ten days or more.

MORTALITY.—At the onset of the epidemic nine-tenths of the cases; on the average about one-half; at the decline a small fraction. Deaths from cholera in England and Wales, in 1831–32, 30,924; in 1848–49, 54,398; in 1853–54, 24,516. Deaths in London, in a million of inhabitants, 6209 in 1849, and 4269 in 1854.

CAUSES.—*Predisposing.* Debility; impaired health; intemperance; impure air; impure water; low and damp situations; the summer and autumn seasons.—*Exciting.* A peculiar poison contained in water arising from the decomposition of animal matter.

DIAGNOSIS.—From *English cholera,* by the greater severity of the symptoms. The complete suppression of urine, the intense blueness of the surface, the hoarse, feeble voice, and the shrunken appearance of the countenance, are the diagnostic signs of this disease. But these marks will not serve to distinguish the disease from the more severe cases of English cholera. The premonitory diarrhœa of cholera is distinguished from ordinary diarrhœa by the absence of pain.

PROGNOSIS.—*Favourable* in the early stage before collapse has set in, and in the secondary stage when the febrile symptoms are slight; *unfavourable* during the stage of collapse, and in the secondary fever when it assumes the typhous character.—*Favourable Symptoms.* Cessation of cramp; subsidence of vomiting and purging, and the reappearance of bile in the motions; voiding of urine; return of the pulse; restoration of heat in the extremities and surface of the body; disappearance of the blueness of the skin and of the facies hippocratica.—*Unfavourable Symptoms.* Extreme collapse; absence or cessation of vomiting and purging in the stage of collapse; deafness; the evacuations of the colour of port wine. Advanced age, previous debility, or ill health, and previous habits of intemperance, are unfavourable circumstances, and the disease is somewhat more fatal in females than in males.

TREATMENT.—I. Of the preliminary diarrhœa. II. Of the stage of collapse. III. Of the stage of reaction.

I. The preliminary diarrhœa requires the treatment of common diarrhœa. A scruple of the compound chalk and opium powder may be given three or four times a day, the diet being at the same time restricted to gruel or arrowroot, made with milk. In more severe cases, grain-doses of opium, in combination with ½ grain of sulphate of copper, may be given every hour, or every two or three hours. When the patient is in a weak and exhausted state, brandy may be administered from time to time. In epidemics of Asiatic cholera, patients suffering from diarrhœa should be promptly treated and carefully watched.

II. The stage of collapse is best treated by large draughts of cold water, or water holding a little chlorate of potash in solution. The most hopeful means of restoring the circulation and of contracting the intestinal vessels, is the injection of the $\frac{1}{96}$ of a grain of Atropia into the arm at intervals of an hour. At the same time reaction should be promoted by warm blankets, bottles of hot water to the feet and epigastrium, and assiduous friction. The patient may be allowed to drink freely of warm brandy and water. The cramps may be relieved by rubbing and the forcible extension of the parts affected.

III. Reaction having been established, the treatment must be guided by the symptoms actually present. The thirst may be assuaged by large draughts of water; diarrhœa, if it exist, may be met by opium in doses of one grain, repeated at short intervals, or by a strong decoction of logwood in combination with laudanum and aromatic spirit of ammonia; and the warmth of the skin may be kept up by frictions and warm applications. In the absence of diarrhœa, the bowels should be relieved by occasional doses of castor-oil.

If the reaction be excessive, and assume the form of fever, it must be treated as enteric fever; and if it assume the typhous type, by the remedies appropriate to that condition.

Prophylaxis.—Temperate habits; wholesome diet; and *pure boiled and filtered water*; the moderate use of wholesome vegetables and ripe fruits; the early treatment of diarrhœa. Those who are able to do so, should remove from low-lying districts to high grounds. On the approach of cholera, the authorities should provide a supply of water of ascertained purity, and prevent access to pumps and sources liable to contamination. They should organize means for the treatment of diarrhœa, and also adopt measures for insuring personal and household cleanliness; for the early removal of all refuse matters; and for the suppression of nuisances. Armies attacked by cholera in low situations should be encamped on high ground, and draw their supply of water from pure springs or rivulets.

Remedies.—Castor-oil, in the dose of a table-spoonful repeated at short intervals, so as "to produce vomiting and purging sufficient to insure, from time to time, the evacuation of the stomach and intestines, and to prevent the accumulation of morbid secretions" as practised by Dr. George Johnson. Saline medicines. Injections of warm water and of warm saline solutions (sodii chloridii, ʒss, sodæ bicarb., gr. c, aquæ callidæ ox.) into the veins (a mode of treatment followed by the most prompt and marked relief to all the symptoms, but not to be commended as curing cholera); transfusion of blood; calomel, in scruple or half-drachm doses every hour; cajeput oil; galvanism; large doses of opiates; camphor; acetate of lead in combination with opium. A drachm of laudanum and a scruple of calomel administered at the first seizure, and repeated at a short interval, if necessary; chloroform; chloroform and brandy; quinine in large doses; Indian hemp.

DISEASES OF THE PERITONEUM.

Peritonitis . .	Inflammation of the Peritoneum.
Ascites . . .	Dropsy of the Belly.

PERITONITIS—INFLAMMATION OF THE PERITONEUM.

Varieties.—1. Simple. 2. Tubercular.

1. SIMPLE PERITONITIS.

Symptoms.—After rigors, but, in some cases, without any preliminary symptoms, pain commencing in any part of the abdomen, and soon extending over the entire cavity, increased by pressure, and often so acute that even the weight of the bed-clothes is intolerable. The skin of the abdomen is hot; the pulse is in general small, hard, and contracted, though sometimes full and soft; the countenance is expressive of great suffering; the patient lies on his back with the thighs drawn upwards, and flexed on the abdomen; the bowels are constipated; the urine scanty and high-coloured; the tongue is white and covered with mucus, and soon becomes dry and brown; the breathing is thoracic, short, each inspiration causing an increase of the pain. There is frequent gulping, and generally constipation, and some strangury. The disease often terminates fatally within twenty-four or forty-eight hours. Death occurs by asthenia, and is preceded by great prostration of the vital powers, sudden cessation of pain, sharpened countenance, distension of the abdomen by liquid or gas, vomiting of a coffee-coloured fluid, cold extremities, and stupor.

Morbid Appearances.—Injection of the vessels of the peritoneum; coagulable lymph spread over the surface, or flakes of lymph floating in serum or pus; the folds of the intestines adherent by coagulable lymph to each other and to the contiguous viscera. In chronic cases the adhesions are organized, binding the intestines so firmly together as to greatly hinder peristaltic movement.

Causes.—Cold and fatigue; constipation; contusions; wounds, surgical operations; parturition; rupture of any of the abdominal viscera.

Prognosis.—*Favourable*, in peritonitis from common and transient causes.—*Unfavourable*, in that produced by mechanical injury, organic disease, parturition, or rupture of the abdominal viscera.

Diagnosis.—From *rheumatism* or *neuralgic pains* of the abdominal muscles, by the pain being increased by pressure, and by the presence of *severe* constitutional symptoms. From colic, by the character of the pain. (See p. 516.) In colic the patient writhes about and changes his position. In peritonitis even the abdominal respiratory movements are avoided. From ovarian inflammation (see Oophoritis). From hysterical tenderness and pain, by the severe constitutional symptoms. The disease, in its early stage, may be distinguished by a feeling of crepitation under the hand, and a *to-and-fro* sound on applying the stethoscope while the abdominal parietes are in motion, as in the act of inspiration.

TREATMENT.—In recent and acute cases bleeding from the arm, followed by leeches and warm fomentations, and the internal use of tartar-emetic with calomel and opium in full doses, and at short intervals, so as speedily to effect the system. In very severe cases, mercurial inunction may be employed at the same time. If the stomach be irritable, the tartar-emetic must be omitted. In less severe cases, leeches to the abdomen, followed by warm fomentations, and calomel and opium internally.

The large intestines may be relieved by enemata of warm water or warm gruel.

If there be painful tympanites, turpentine enemata are required, or the long elastic tube may be introduced so as to allow the accumulated gas to escape.

When effusion has taken place, and the febrile symptoms have abated, the treatment will be that of ascites.

Chronic peritonitis must be treated by the repeated application of leeches, blisters, and stimulant embrocations to the abdomen. If the intestines become adherent from organization of the plastic lymph thrown out around them, obstinate constipation is the result. The intestines being firmly bound together are no longer able to perform their peristaltic movements. Such cases require very careful treatment. Only such food should be taken as is readily absorbed. The constipation must be treated by enemata and very mild laxatives, such as castor-oil and confection of senna.

2. TUBERCULAR PERITONITIS.

SYMPTOMS.—These come on very insidiously. The abdomen slowly enlarges until it at last attracts the notice of the patient, and when he first comes under treatment ascites to a considerable extent is present. The general health now begins to fail; emaciation, sweating, and diarrhœa, alternating with constipation, set in; the abdomen becomes tense, painful, and tender (the pain is at first deep-seated); hectic, and gastro-intestinal irritation, resulting in vomiting and more severe diarrhœa, sooner or later supervene, the food is rejected, and the patient dies of asthenia. Sometimes the mesenteric glands and the folds of the mesentery are the chief seat of the tubercular deposit, and hard nodular tumours may be felt through the abdominal walls, and the chief, and it may be, only other symptoms present, are emaciation and swelling of the belly. This variety of the disease is called *Tubercular mesenteritis* and *Tabes mesenterica.* It is only in the latter stages of this variety that ascites becomes a prominent symptom. When the tubercular matter is deposited simultaneously in the mesenteric and intestinal glands and upon the general peritoneal surface, the emaciation is very rapid, and the pallor of surface extreme.

MORBID ANATOMY.—If the disease kills speedily, the peritoneal cavity will be found distended with clear serum, and the peritoneal covering of the intestines uniformly granular with miliary tubercles the size of hemp seeds. The mesenteric glands are more or less enlarged and hardened. In the more chronic form the mesenteric glands are greatly enlarged, forming hard nodular matted masses. When opened the centres of many will be found softened. When persistent and intractable diarrhœa has been a prominent symptom, we may expect to find tubercular ulceration of Peyer's glands. (See page 509.)

DIAGNOSIS.—From ascites, caused by hepatic disease, by the absence of jaundice and hepatic enlargement or inequality. From enteric fever (see page 301). The disease is often accompanied, sooner or later, by symptoms of pulmonary phthisis.

TREATMENT.—Iodide of iron alone or combined with cod-liver oil. Alternate infrictions of cod-liver oil and iodine unguents into the abdomen. Chalybeate tonics. The gastro-intestinal symptoms must be treated as directed under Phthisis and Partial Enteritis.

ASCITES—DROPSY OF THE BELLY.

SYMPTOMS.—A progressive and uniform enlargement of the abdomen, accompanied, when the quantity of fluid is large, by tension of the parietes; dulness on percussion over the whole abdomen, when the fluid is abundant; and when small, over the part to which the position of the patient causes it to subside, the rest of the abdomen being tympanitic; and a sense of fluctuation becoming more distinct as the quantity of fluid increases.

The general symptoms of ascites are due to pressure of the accumulated fluids, and when it is merely a symptom of some other disease, to the particular disease present. The symptoms arising from pressure are difficulty of breathing; suffusion of the countenance, and injection of the eyes; and distension of the superficial veins of the abdomen. Thirst, a dry skin, scanty urine, and torpid bowels, are among the most common accompaniments of ascites.

The disease seldom continues long without inducing, or being accompanied by an anasarcous state of the lower extremities.

CAUSES.—The general causes of dropsy (see Hydrops). Disease of any organ obstructing the portal circulation. Ascites, therefore, is the immediate consequence of obstructive diseases of the liver, and of cirrhosis in particular; cancerous disease of the pancreas, involving the portal vein, is an occasional cause. Diseases of the spleen and mesenteric glands; of the heart, lungs, and kidney; scarlatina; loss of tone in the peritoneum after pregnancy; chronic or sub-acute inflammation of the peritoneum; and local injury, or other causes of ascites.

DIAGNOSIS.—From *ovarian dropsy*, by the uniform enlargement and greater width of the abdomen, which sways from side to side according to the position of the patient. From *tympanites*, by the dulness on percussion over the seat of the fluid, or over the greater part of the abdomen. When the intestines are distended with air they float on the surface of the fluid, giving a tympanitic resonance to the upper parts of the abdomen. The pregnant uterus forms a defined rounded tumour, which contracts under the hand; moreover, we may feel the fœtal movements, and hear the pulsations of the fœtal heart. A distended bladder causes a uniform pyriform enlargement above the pubes, and is associated with constant dribbling of urine.

Prognosis.—*Favourable.* The ascertained absence of organic disease of the viscera of the chest and abdomen. The urine healthy, in quality and quantity, and not coagulating by heat; moist skin; the swelling of the abdomen diminishing; the respiration becoming free; the strength little impaired.—*Unfavourable.* Organic disease of the viscera of the chest and abdomen, especially of the liver; great emaciation; sympathetic fever; coma; an impaired constitution.

Treatment.—If pain and tenderness exist, leeches to the abdomen, followed by mercury so as to affect the mouth. If both are absent, the treatment must vary with the disease, of which the ascites is the effect. If disease of the liver, heart, lungs, or kidney be present, the remedies appropriate to that disease. The remedies for the dropsy itself, irrespective of the causes which may have produced it, are diuretics, and drastic purgatives, unless contra-indicated. The choice of diuretics must be partly determined by the cause of the dropsy, and partly by the existing state of the patient.

If, after a fair trial, these remedies are unavailing, and the pressure becomes insupportable, recourse must be had to tapping.

Ascites is often combined with anasarca.

DISEASES OF THE LIVER.

CONGESTIO	Congestion of the Liver.
HEPATITIS	Inflammation of the Liver.
ABSCESS	Of the Liver.
ACUTE ATROPHY . . .	Of the Liver.
BILIARY CONCRETIONS, or	Gall Stones.
ICTERUS	Jaundice.
OTHER DISEASES . . .	Of the Liver.

CONGESTION OF THE LIVER.

Varieties.—1. Sanguineous. 2. Biliary.

1. SANGUINEOUS CONGESTION.

Symptoms.—A sense of fulness and weight in the right hypochondrium, rarely amounting to dull pain; enlargement of the liver, so that the lower edge can be felt two or three fingers' breadth below the margin of the ribs; sallowness of the complexion, with sometimes distinct yellowness of the conjunctiva; in severe congestion, complete jaundice; anorexia; tongue coated with a white fur; bowels torpid.

Morbid Anatomy.—Increase in the size and weight of the liver, which is dark-coloured and gorged with blood. If the congestion affect the hepatic and portal veins unequally, the liver has a distinct mottled appearance. When the congestion affects only the hepatic vein, the lobules have a light border (C) and a dark centre (A); the congestion is chiefly intralobular (Fig. 71). When the portal vein is alone congested, the outer portions of the lobules are darker than their centres, and the congestion is said to be interlobular (Fig. 73).

Fig. 71.

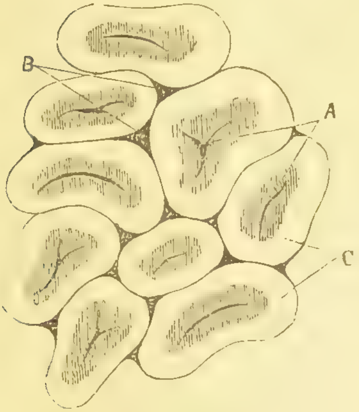


Fig. 72.*

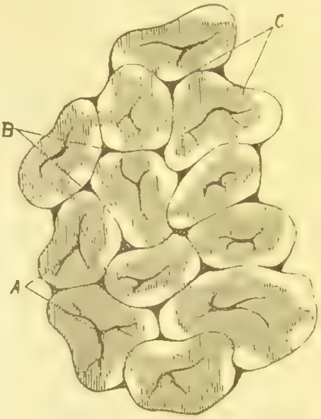
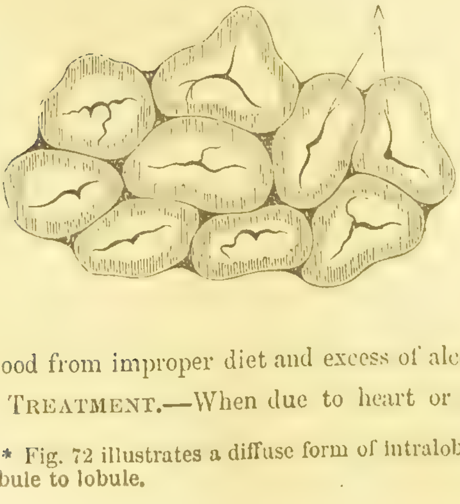


Fig. 73.



Causes.—Diseases of the heart and lungs, and tumours within the chest, obstructing the thoracic circulation; functional derangement of the liver itself, with diminished activity of the secreting function; intermittent fever; purpura; impurity of the blood from improper diet and excess of alcoholic fluids.

Treatment.—When due to heart or lung disease, the same treatment must be adopted as for congestion of the stomach arising from the same causes. In all other cases, gr. v pilulæ hydrargyri, or gr. iv calomelanos, followed, after twelve hours, by a brisk saline purgative, should be prescribed, and a light farinaceous diet, and abstinence from fermented or spirituous liquors enjoined.

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* Fig. 72 illustrates a diffuse form of intralobular congestion spreading from lobule to lobule.

2. BILIARY CONGESTION.

SYMPTOMS.—"A bilious attack," viz., vomiting and purging of matters highly charged with bile, usually preceded by constipation, and accompanied by pain in the hepatic region, some enlargement of the liver, and a biliary tinge of the conjunctivæ.

CAUSES.—Biliary congestion is the effect of excessive functional activity of the liver, from overfeeding or indolent habits, or a combination of the two. The functions of the liver and lungs are to a considerable extent vicarious. The digestion and assimilation of animal diet is attended by separation of a large quantity of hydrocarbon from the blood. If the respiratory function be sufficiently active, this is consumed in the lungs, and excreted as carbonic acid and water; but if, as in tropical climates, the respiratory function be insufficient, the hydrocarbon is separated by the liver in the form of the fatty acids of the bile. This secretion becomes immoderate, the liver is congested with it, and occasional relief is afforded by bilious diarrhœa. This result happens both to those natives of cold climates who, when resident in tropical regions, do not adapt their diet to the altered conditions of their existence, and to those who, in any climate, feed heartily and take little exercise.

Biliary congestion is of course an immediate consequence of closure or obstruction of the common bile duct.

TREATMENT.—After a dose of calomel or blue pill, free saline purgation; abstinence from fermented and spirituous liquors; plain diet, consisting chiefly of farinaceous substances.

HEPATITIS—INFLAMMATION OF THE LIVER.

1. ACUTE HEPATITIS.

SYMPTOMS.—Pain in the right hypochondrium, increased by pressure, by deep inspiration, by coughing, or by lying on the left side; dry cough; difficulty of breathing; shooting pains in the chest; resembling pleurisy; sympathetic pain in the right shoulder; yellow tinge of the conjunctiva, and sometimes actual jaundice; high-coloured urine; vomiting; hiccup; rigidity of the right rectus muscle; costiveness or diarrhœa. There is also more or less pyrexia. In some cases, the fæces are of a clay colour, owing to a deficiency of bile; in others, the bile is in excess, and is rejected by vomiting and stool.

When the *concave* surface is affected, the pain is more obscure, and is referred to the back; the breathing is less affected; but the functions of the stomach are more disturbed. The same disturbance takes place when the left lobe adjacent to the stomach is inflamed; and when the posterior and inferior portion of the organ is implicated, there is more or less pain and disturbance of function in the kidney.

TERMINATIONS.—In resolution; in diffused or circumscribed abscess; in gangrene; in chronic disease.

CAUSES.—All the common causes of inflammation; external injury; intemperance; protracted biliary congestion; dysentery; pneumonia; phlebitis of the portal vein or its tributaries.

DIAGNOSIS.—From *pneumonia*, by the absence of the local signs of that disease; by the pain in the shoulder; by the local pain, increased by pressure; by the yellowness of the skin and conjunctiva; by the colour of the urine and fæces; and in many cases by the absence of cough and expectoration.

From *gastritis*, by the seat of the tenderness, and by the colour of the eye and skin, of the urine and fæces.

PROGNOSIS.—*Favourable.* About the third, fifth, or seventh day, bilious diarrhœa; universal free perspiration; hæmorrhage from the hæmorrhoidal veins; an abatement of fever.—*Unfavourable.* Intense pain and fever; the pain confined to a point; continual hiccup; cold extremities; obstinate constipation; rigors and hectic fever, indicating the formation of abscess.

TREATMENT.—Local depletion by cupping or leeches; or, when the hæmorrhoidal or catamenial evacuations are suppressed, the abstraction of blood from the anus; blisters over the seat of the pain; brisk saline aperients; saline and antimonial diaphoretics; mercurial inunction; especially during the inflammatory stage of the disease; a low diet, consisting chiefly of farinaceous food.

2. CHRONIC HEPATITIS—CIRRHOSIS.

SYNONYMS.—Hepatitis chronica, diffusa, adhesiva; interstitial hepatitis; hob-nailed liver; gin-drinkers' liver; chronic atrophy.

SYMPTOMS.—The early symptoms are very obscure. There is a sense of weight with obtuse pain in the region of the liver, increased by deep pressure or by lying on the left side, with enlargement and preternatural hardness of the organ, obvious to the touch. During the progress of the disease, symptoms of more acute hepatitis, and sometimes jaundice, are occasionally present. There is a sense of fulness and distension of the stomach, with flatulence, and loss of appetite. The countenance is sallow, and the skin harsh and dry; the patient is torpid, inactive, and desponding; the bowels are obstinately costive; the stools deficient in bile; and the abdomen enlarges imperceptibly at first, and well-marked ascites is usually present when the attention of the physician is first called to the case. The ascites increase; the legs become œdematous; the veins of the abdomen are prominent; the urine is scanty, and deposits lithates, but rarely or never contains albumen. Symptoms of congestion of the alimentary canal appear:—the furred tongue is dryish, there is much thirst, and hæmorrhage from the bowels or stomach is very liable to occur. The blood becomes much impoverished, and slight wounds bleed profusely; minute capillary aneurisms occasionally form in the skin, burst, and bleed freely. Under careful treatment the patient may improve for a time, but sooner or later the digestion fails, he loses flesh, and becomes anæmic; a copious hæmorrhage from the bowels, or profuse diarrhœa, causes great debility, and ultimately the patient dies exhausted.

PATHOLOGY.—Diffuse inflammation of the connective tissue of the portal canals and interlobular spaces, with effusion of solid products. These subsequently undergo organization and contraction, and form a dense fibrous network of new connective tissue throughout the liver. The contraction of the new material causes obliteration of the smaller branches of the portal vein and bile ducts, resulting in atrophy of the lobules. Great obstruction to the portal circulation thus gradually results, ending in the most irremediable form of ascites and anasarca.

MORBID ANATOMY.—The liver reduced in size, of a light yellow colour like bees'-wax, presents a coarse tubercular appearance, its surface being studded over with rounded elevations of various sizes, projecting from the interior. Capsule thickened and opaque; tissue harder than normal, sometimes cutting like gristle; the cut surface presents intersecting lines of opaque connective tissues, forming a coarse network in which the yellow nodular masses are contained. The walls of the portal vein are thickened, surrounded by condensed connective tissue, and their calibre is much diminished. The gall-bladder is collapsed, and contains a little transparent golden-yellow or light ochre-coloured grumous fluid. On minute examination, a large portion of the hepatic cells are found to be destroyed, and their places occupied by masses of light-yellow pigment, scattered through a network of newly-formed connective tissue. In other places the cells are shrunken, and are in a state of fatty degeneration. The capillaries of the lobules are degenerated, and their place supplied by a few narrow vessels which serve to convey the blood into the radicles of the hepatic vein. The bile ducts are atrophied, and many of the smaller branches, as well as most of the tubular network within the lobules, obliterated. Great enlargement of the spleen, and congestion of the portal system.

CAUSES.—The acute form; the abuse of ardent spirits; the disease is very common amongst cabmen, who drink much neat spirits.

DIAGNOSIS.—Sallowness of the skin, never amounting to jaundice; a dryish tongue, and thirst, preceded or accompanied by a little dull pain and tenderness in the right hypochondrium, coming on after the age of puberty, is strong presumptive evidence of cirrhosis. If these symptoms occur in a person who has indulged freely in spirituous liquors, the case is quite clear. In *tubercular peritonitis* there is diffused pain and tenderness over the whole of the belly, and the sallow look of cirrhosis is absent; the ascites, moreover, is never so great as in cirrhosis, and the fluctuation is less distinct, because the fluid is retained in pouches formed by the adherent intestines. In *cancer* of the liver the ascites is never very great; the liver, moreover, enlarges, and there is the characteristic cachexia, sweating, and emaciation, and eventually jaundice. The nodulated enlargement, known as the "hob-nail liver," may be perceived through the parietes, and distinguished from the single large round projection caused by a collection of *hydatids*, and from the smooth round tumour near the margin of the liver, caused by a *distended gall-bladder.*

PROGNOSIS.—Unfavourable, the progress will be downwards and rapid.

TREATMENT.—I. In the early stage leeches to the region of the liver as often as it is tender to the touch; blisters; and mercurial preparations in small doses, often repeated, with mercurial inunction, so as slightly to affect the gums.

II. The portal circulation must be relieved by saline aperients, given every morning, so as to keep the bowels loose. When the intestinal canal is healthy, drastic purgatives are often more effective than any other remedies. If the digestive powers are much impaired, a course of bitter tonics, such as the infusions of gentian, quassia, or calumba, with soda, or some preparation of steel, if the patient be anæmic. The nitric or nitro-muriatic acid internally (Form. 137) may be used as a bath (Form. 43). Partial tapping must only be resorted to in the extremest urgency, as it is never followed by permanent advantage; if the whole of the fluid be withdrawn, there is danger of fatal exhaustion.

ABSCESS OF THE LIVER.

SYMPTOMS.—If in a case of hepatitis severe rigors occur, followed by well-marked hectic fever, and the previous continued pain, whether dull or acute, be exchanged for a distinct throbbing, there is reason to believe that suppuration has taken place. Rigidity of the right rectus muscle usually accompanies abscess of the liver.

The abscess may burst into the stomach, and be emptied by vomiting into the colon or duodenum, and be evacuated by the bowels; through the diaphragm into the cavity of the chest, giving rise to empyema; into the lung or bronchial tube, and be expectorated; or, it may open externally, between the ribs, or below them through the muscles of the abdomen or back. In very rare cases, the abscess discharges itself into the pericardium, into the pelvis of the kidney, into the ascending vena cava, or into the cavity of the abdomen.

CAUSES.—*Predisposing.* Those of the inflammation of the liver which precedes it.—*Exciting.* Phlebitis (leading to purulent deposits in the liver and lungs). Dysentery. Operations on the rectum, bladder, or vagina. Ulceration of the stomach and intestines. Animal parasites:—Echinococcus, Distomum, and Bilharzia.

COMPLICATIONS.—Ascites. Inflammation of the organs contiguous to the abscess, and through which it ultimately discharges itself.

DIAGNOSIS.—The nature of the disease will be inferred from the colour of the discharged matter, and from the rigors, throbbing pain, and hectic fever attending the process of suppuration.

PROGNOSIS.—This will depend, in great measure, on the direction in which the abscess discharges itself, and on the degree of inflammation which follows. The prognosis is most favourable when the opening is in the parietes of the chest or abdomen. It is extremely unfavourable when the abscess bursts into the peritoneum. If it become encysted, the health may remain unimpaired for years.

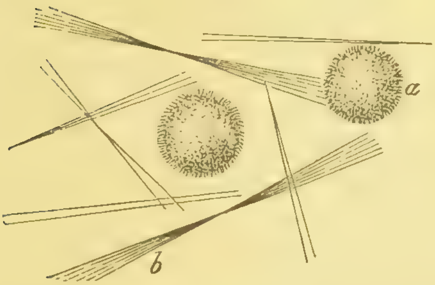
TREATMENT.—If the abscess point externally, it must be brought forward by poultices and fomentations, and the matter must be discharged by a trocar and canula. Such an operation should not be performed unless we have reason to infer that there is adhesion between the sac of the abscess and the abdominal wall. A generous diet, and tonics, especially quinine and the mineral acids, must be prescribed.

HEPATITIS DIFFUSA—YELLOW OR ACUTE ATROPHY.

DEFINITION.—Acute disease of the liver, probably of an inflammatory nature, leading to total suppression of bile and degeneration of the secreting structure.

SYMPTOMS.—For a variable period of a week or more before any positive symptoms appear, there are usually indications of hepatic derangement; the bowels are irregular, sometimes purged and sometimes constipated; the abdomen is slightly tender, the tongue coated; there is loss of appetite, and headache. Sooner or later the skin presents a slight jaundiced tint. After the jaundice has existed for a week or fourteen days, or even longer, severe symptoms of biliary suppression manifest themselves, and the disease runs a violent course, terminating fatally in twelve or twenty-four hours, or more rarely in a week. The skin, which was at first cool and dry, now becomes hot, and of a deeper yellow colour; the pulse rises to 110–120; the head is hot and painful; severe vomiting comes on, first of grey mucus, afterwards of blood, clotted, or grumous like coffee-grounds; hæmorrhage, from the bowels, uterus (with abortion), and nose, is liable to occur. There is pain in the right hypochondrium, and the hepatic dulness is found on percussion to have diminished or disappeared, while that of the spleen has increased; the bowels are confined, and the stools firm, dry, and clay-like, from deficiency of bile; occasionally they are tinged with bile. The urine is normal in quantity and specific gravity, of a dark-brown colour, and gives the reactions of bile pigment. Spontaneous evaporation on a glass slide yields microscopical yellowish crystals of leucin and tyrosin in fine needles, and bundles or dense opaque stellate masses (see Fig. 74), consisting of crystals of tyrosin. The pain in the head increases in severity, violent delirium sets in, and is succeeded by convulsions, stupor, and deep coma; hiccup and diarrhœa are often present at this stage; the skin becomes deeper coloured, and frequently covered with petechiæ and ecchymoses, and the motions are tar-like, from the presence of blood. In this condition the patient usually dies. Rarely after free evacuation of the bowels, consciousness returns, the jaundice diminishes, and recovery takes place.

Fig. 74.



MORBID ANATOMY.—Liver shrunken, shrivelled, and flabby. Sections present a smooth, shining surface, of an ochre yellow colour; but no division into lobules is visible. When minutely examined no trace of hepatic cells can be found; the atrophied hepatic tissue is composed of fine yellow or pale molecules; a little oil in fine spherules; here and there irregular masses of a dark-brown colour, and bundles or radiating crystalline masses of tyrosin; the biliary ducts are everywhere pervious, and their lining pale. The gall-bladder nearly empty, containing only a small quantity of grey mucus or grumous pale yellow fluid, neutral, and giving the ordinary reactions of bile. The blood of the hepatic vein is rich in crystals of tyrosin, but this compound is absent from the blood both of the portal vein and hepatic artery; decoction of the wasted liver deposits much tyrosin and leucin. Leucin and urea are accumulated in the blood of the heart. The urine is deficient in phosphate of lime and urea, and contains large quantities of leucin, tyrosin, and extractive matters of a peculiar nature. The spleen is enlarged and congested; and extravasations of blood between the folds of the mesentery are occasionally found. (Frerichs.)

CAUSES.—*Predisposing.* Youth; irregular and dissolute habits; syphilis; pregnancy; certain miasmata (?)—*Exciting.* The symptoms and morbid anatomy both point to diffuse inflammation of the hepatic tissue:—"hyperæmia and grey exsudation in parts not yet broken down" have been noticed. (Frerichs.) The obstruction to the portal circulation, causing the splenic enlargement and the gastro-intestinal congestion, are accounted for by the loss of function of the hepatic cells and the consequent collapse of the liver.

DIAGNOSIS.—Acute atrophy may be mistaken for typhus, pyæmia, and yellow fever. There appears to be a close relation between yellow fever and acute atrophy of the liver, but whether such be really the case is uncertain. Acute atrophy is known by the shrinking of the liver, and by the presence of leucine in the urine.

PROGNOSIS.—Exceedingly unfavourable.

TREATMENT.—At first a powerful emetic, and afterwards a large dose of calomel, followed by a strong saline aperient; hot baths; leeching and cupping over the liver, or six leeches applied around the anus. An occasional dose (v grains) of quinine in a little water.

BILIARY CONCRETIONS—GALL-STONES.

SYMPTOMS.—Biliary calculi give rise to no pain or inconvenience, till they become impacted in the gall-ducts. The passing of the gall-stone is accompanied by the following symptoms:—Excruciating pain in the epigastrium, extending to the right hypochondrium and back, occurring in severe paroxysms, with intervals of comparative ease, during which there is a dull heavy pain in the epigastrium, generally relieved by firm pressure. Nausea, frequent vomiting of a clear sour fluid, and constant hiccup, are also often present, and jaundice commonly supervenes in the course of the attack. The urine generally contains bile, and the motions are pale from its absence. The pulse is infrequent and full, or the reverse; there is profuse perspiration; or, if inflammation be present, febrile symptoms. As soon as the calculus reaches the intestine, there is a sudden cessation of the pain.

TERMINATIONS.—In inflammation, followed by suppuration, the discharge of the calculus externally, or through some internal organ, as in ordinary abscesses of the liver. After the escape of the gall-stones into the intestines, constipation or obstinate obstruction of the bowels, either immediate, when the stones are large, or remote, when they have become the centres of intestinal concretions. Sometimes a large number of calculi are found in the gall-bladder and gall-ducts after death, though no sign of their presence existed during life. Complete obstruction of the common bile duct, and deepest jaundice may exist for several months, or even years, without preventing the patient from following heavy manual work; but after a time he lapses into the anæmic state. and ultimately dies of inanition.

MORBID ANATOMY.—After long retention of bile from closure or obliteration of the common bile duct, the ducts in the liver are found enormously dilated, while the gland itself is shrunken and atrophied. It is of a deep olive colour; the secreting cells are destroyed, and their place occupied by free oil globules and dark biliary granules.

DIAGNOSIS.—The pathognomonic sign is the excruciating pain relieved by pressure. When the gall-stones are numerous, their presence may sometimes be detected by a rough crepitation under the finger. By watching the evacuations, and diluting them with water, they may sometimes be seen floating on the surface. If the gall-stone be round and smooth, there is presumption in favour of its being the only one;

but if it present a flattened surface, it may be inferred that there are several. The calculi may be as small as peas or larger than a walnut; and they have been found in the intestines of great size, and moulded so as to fill and obstruct the canal. They are commonly of a dark-yellow brown colour, of soft consistence, and have several flat surfaces. They consist of cholesterin and the colouring matter of the bile, sometimes blended with carbonate or phosphate of lime.

Treatment.—I. Opium, chloroform, the hot bath, hot fomentations, or emetics to relieve the pain and spasm. The *opium* may be given in doses of a grain, or twenty drops of laudanum, every hour, and the enema opii every six hours. *Emetics* are admissible in the absence of inflammation, but not when inflammatory symptoms exist.

II. In plethoric persons, or in those prone to suffer from inflammatory diseases, bleeding will do good. It may be followed, in the absence of vomiting, by nauseating doses of tartar-emetic.

ICTERUS—JAUNDICE.

Synonyms.—Morbus arquatus; aurigo; morbus regius.

Symptoms.—Languor; inactivity; nausea; loss of appetite, and bitter taste; and sense of uneasiness or pain in the right hypochondrium. The sclerotic of the eye and the whole surface of the body are of a yellow colour; the urine is high-coloured, and tinges linen yellow; the stools are like clay, but in some cases, like the urine, of a yellow colour; the bowels are usually costive, but diarrhœa is sometimes present; in extreme instances, the sweat and saliva are yellow, and all objects seen by the patient are tinged of the same colour. The pulse is generally slow, yet sometimes, especially when the pain is acute, becomes quick and hard, and there is a feverish heat and dryness of the skin. In some cases, also, the skin is the seat of troublesome heat and pricking. Should the disease be long protracted, petechiæ and maculæ sometimes appear in different parts of the body; the skin, before yellow, turns brown or livid; even passive hæmorrhages and ulcerations have broken out, and the disease has in some instances assumed the form of scurvy.

Causes and Pathology.—Jaundice is directly produced by the transudation of bile through the walls of the distended bile ducts, and the contiguous capillaries, into the blood. The ultimate cause of jaundice is therefore retention of the bile within the liver. The retention may be complete or incomplete. *Complete retention* is caused by the impaction of biliary calculi in the hepatic duct or its main branches, or in the common bile duct, by the pressure of cancerous tumours of the pancreas, duodenum, pylorus, and of the liver itself; by the pressure of fæcal accumulations, and of the enlarged uterus; by inflammation of the lining membrane of the ducts causing their occlusion.

Inflammatory occlusion of the duodenal orifice of the common duct may probably be sufficient of itself to cause complete retention.

Spasmodic closure of the bile ducts was formerly regarded as a frequent cause of jaundice. It may be a transient cause, but it is highly improbable that jaundice of some days' standing is due to spasm.

Incomplete retention may result from biliary congestion; from the effect of certain poisons, especially the poison of serpents; from mental emotion, which may act directly upon the circulation in the liver by affecting the nerves distributed to the coats of the portal vein.

Jaundice is a prominent symptom of the severer forms of intermittent and relapsing fevers; it occasionally appears in a milder degree, during attacks of typhus fever, pneumonia, and pyæmia. To account for its appearance in these latter cases, and in some other conditions where the bile ducts remain pervious, Frerichs has propounded the theory of "obstructed metamorphosis of bile in the blood." This theory assumes that the colourless fatty acids of the bile are absorbed into the blood, and are there transformed into biliary pigment. In a state of health this pigment is transformed by the respiratory process into colourless compounds. But in certain diseases, such as pyæmia and pneumonia, in which the oxidising process (respiration) is defective, the metamorphosis of the biliary pigment is incomplete, and faint jaundice or sallowness of the skin, or deposits in the urine of a blood-red colour, and deposits of uroglaucin and urophæin appear, to indicate the several stages of the metamorphosis.

The facts upon which this theory is founded are the following:—1. "The pure colourless acids of the bile may, by the action of concentrated sulphuric acid, be transformed into *chromogene*, which upon exposure to the air, and still more readily on the addition of nitric acid, exhibits alternations of tints corresponding in every respect with bile pigment." 2. "The same pigments and colour-producing substances (chromogene) which in their properties precisely resemble cholepyrrhin (the colouring matter of human bile) are produced by the injection of colourless bile into the vascular system of living animals." 3. "The normal presence of a considerable quantity of taurin in the lungs." Such a theory is not necessary to account for the production of jaundice in pneumonia and pyæmia. Both congestion of the liver and hepatitis may produce the slight jaundice occasionally present in these diseases. Both of these conditions, the one as a consequence and the other as an accident, accompany pneumonia; and suppurative hepatitis is one of the commonest results of pyæmia. Neither, when we consider analogous changes, does the sudden production of jaundice from fear, or other intense mental emotion, involve any special difficulties. Sudden fright, we know, will often cause an immediate exsudation from the skin and alimentary canal, leading, in the latter case, to profuse diarrhœa; and if we imagine a similar relaxation of the biliary ducts allowing of the transudation of bile into the equally relaxed capillaries, we shall at once understand how the Abbé, as mentioned by Villermi ("Dict. des Scienc. Medic.," p. 420) became suddenly yellow when a mad dog rushed against him. Jaundice is frequently attributed to grief and other depressing passions, nor do we deny that it may be so produced; but we believe that if such cases were carefully investigated, in nine out of ten a much more palpable cause would be discovered, viz., alcohol, which is so often taken to blunt and dispel grief. Several cases have convinced me that this agent acts locally by producing inflammatory occlusion of the orifice, or of the orifice and some portion of the duodenal end of the bile duct. One history will serve for all these cases, so similar were the circumstances attending them. A young robust labouring man in perfect health, to allay a sudden vexation, intoxicated himself by drinking three or four glasses of neat rum. The next day there was anorexia, nausea, and some pain and tenderness of the epigastrium. On the morning of the third day, the skin was moderately jaundiced, the urine contained much bile, the fæces were devoid of it, and the bowels constipated. The jaundice increased in intensity during the next three or four days, and then, under the influence of free saline purgation, gradually diminished, and disappeared at the end of twelve days. The simple and most obvious explanation of such cases is, that the gastro-duodenal inflammation caused by the raw spirit involved the duodenal end of the common bile duct, and occluded it, thus preventing the flow of bile into the intestine. The mineral irritants appear to act in the same way. A patient took, by mistake, five doses of a strong solution of acid muriate of iron. It produced epigastric pain and tenderness, followed by deep jaundice.

Diagnosis.—The characteristic symptoms which distinguish this from every other disease are, the yellow colour of the skin, conjunctiva, and the urine; and, in most cases, the white or clay-coloured fæces.

Prognosis.—*Favourable.* The disease having arisen from a cause that admits of easy removal; such as violent mental emotion, accumulated fæces, or temporary pressure during pregnancy; the strength and appetite little impaired; the disease appearing suddenly; cessation of local pain, followed by bilious diarrhœa. The disease, even in mild cases, runs a chronic course, the skin rarely recovering its proper colour under two or three weeks.—*Unfavourable.* Deep and persistent jaundice with anæmia, acute atrophy, cirrhosis, and cancer of the liver.

Treatment.—Jaundice from inflammation of the liver, or from obstruction of the duct, requires the treatment of hepatitis or of biliary concretions. (See those diseases.) When, however, there is no pain in the right hypochondrium, no fever, and the paroxysms of acute pain due to the passage of gall-stones are absent, the treatment will consist in the use of emetics, and of gentle aperients to keep the bowels free. In the more strongly-marked cases of jaundice, we may begin the treatment by administering an emetic (Form. 220); and afterwards x to xx grs. of calomel, followed within two or three hours by an ounce of castor-oil. In cases of less severity, the treatment having been commenced by an emetic, the bowels may be kept free by some saline aperient (Form. 259).

Icterus Neonatorum.—The jaundice of new-born children usually appears a few hours after birth, attains its maximum in three days, and disappears in from seven to fourteen days. The urine contains bile pigment, and the motions are pale; the general health is unaffected.

Causes.—According to Frerichs, "the diminished tension of the capillaries in the liver, which takes place upon the stoppage of the influx of blood from the umbilical vein, and which gives rise to an increased transfusion of bile into the blood." It is difficult to understand how a partially empty condition of the blood-vessels of the liver can produce increased transfusion of bile into the blood. It is much more reasonable to suppose that the jaundice arises from a *congested* condition of the hepatic capillaries. At the time of the ligature of the cord, the pulsation of the placental extremities of the hypogastric arteries has altogether ceased, or become very feeble, and much of the venous blood has drained out of the placenta into the body of the child. Such being the conditions, a little consideration will show that simultaneous ligature of the umbilical vein and hypogastric arteries must cause such disturbance of the balance of the circulation as, if uncompensated by the expansion of the lungs, will, after a few hours, result in general visceral congestion—ligature of the umbilical arteries at once producing increased pressure on the aortic circulation which is transmitted backwards through the heart to the inferior cava.

The jaundice of new-born infants is occasionally caused by constriction, an impervious condition, or congenital absence of the hepatic or common bile ducts; inspissated bile obstructing these ducts is another cause. In these cases life may be prolonged for several weeks.

Treatment.—Mild laxatives, such as syrupus sennæ, preceded by gr. i to gr. ii hydrargyri cum cretâ.

OTHER ORGANIC DISEASES OF THE LIVER.

The liver is subject to several organic diseases besides those already described; namely, to fatty and waxy degeneration, cancerous, syphilitic, and tubercular deposits, serous cysts, and hydatids.

FATTY DEGENERATION.—The *symptoms* are, a smooth, rounded margin felt three or four fingers' breadth below the margin of the ribs, increased dulness of the hepatic region, pale fæces, liability to profuse pale diarrhœa. Skin pale, anæmic, waxy and smooth to the touch: in drunkards greasy. As there is no impediment to the flow of blood through the liver, there is no dropsy or hæmorrhage.

Morbid Anatomy.—Bile ducts empty; liver enlarged, pale, and greasy, or (in drunkards) dark dirty brown, and rotten (the nutmeg liver). Cells invaded with fat, and deficient in pigment granules. (Fig. 7, *b*, p. 83.)

Causes.—Phthisis; habits of intoxication, and a sedentary life; Bright's disease. The disease admits of no direct amelioration.

SYPHILITIC DISEASE OF THE LIVER occurs in two forms:—1. Simple interstitial hepatitis. 2. Hepatitis gummosa. These forms may co-exist in the same liver.

The *symptoms*, *pathology*, and *morbid anatomy* of simple interstitial hepatitis are those of cirrhosis; the syphilitic variety of the disease, however, more frequently results in simple induration without the formation of the nodules characteristic of cirrhosis. Hepatitis gummosa consists in the formation of white depressed deposits, having a radiated form, on the surface of the liver, and extending to a variable depth into the interior of the gland. In this opaque deposit, whitish or yellowish nodules, varying in size from a hemp-seed to a walnut, are found. They are composed of oil globules, cells loaded with fat, and fibres of connective tissue, being identical in structure with the common syphilitic node.

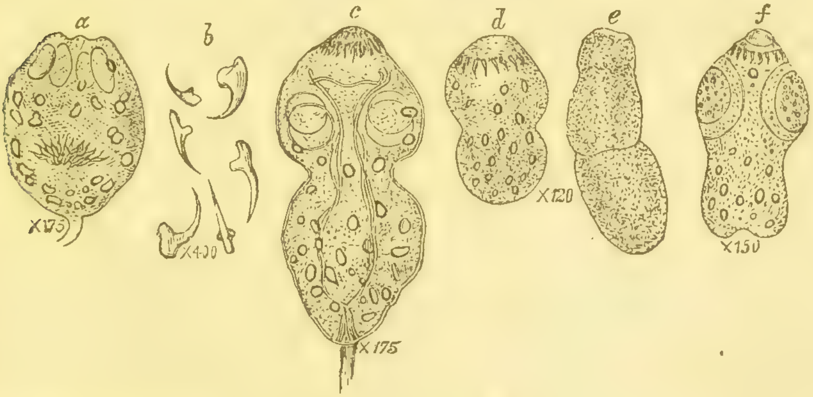
ALBUMENOID, WAXY, LARDACEOUS, OR AMYLOID DEGENERATION OF THE LIVER is associated with a similar degeneration of other organs. It occurs in syphilitic, rickety, and strumous individuals, and is often associated with fatty degeneration and cirrhosis. The *symptoms* are anæmia associated with albuminuria and uniform enlargement of the liver, sometimes to an enormous extent.

Morbid Anatomy.—In the early stage the lobular structure is unusually distinct, the centres of the lobules are reddish-yellow, translucent, firmer than natural, and sharply defined from the dull grey peripheral parts. As the disease advances the whole of the lobule is invaded, and when this has occurred they are no longer distinct, and the section of the gland presents a smooth, homogeneous, yellowish-red, glistening, semi-translucent surface. In advanced stages the liver has a waxy lustre, the molecular contents of the normal hepatic cells gradually disappear and give place to a homogeneous clear substance, which fills up the cavity of the cell, and the individual cell membranes can be no longer distinguished, so completely is the tissue transformed. The walls of the blood-vessels and ducts undergo the same degeneration. On moistening the section with solution of iodine, all the parts which have undergone the waxy degeneration are coloured deep red, and when subsequently treated with sulphuric acid, the red colour is changed to a dirty violet or blue, similar to that produced in cellulose with the same reagents. These reactions have led some observers to the opinion that the degeneration is "*amyloid.*" It is as distinct from starch as white of egg, being in fact a form of albumen.

HYDATID TUMOURS are more common in the liver than in any other organ. *Symptoms.*—A globular tumour in the hepatic region having a tense feel and a history of slow, painless growth, and unaccompanied by any considerable derangement of the health, is fairly indicative of hydatid tumour of the organ. The tumour may have its seat on the under surface of the liver, and by pressure on the portal vein or bile duct cause ascites or jaundice. An abscess is always preceded by some marks of inflammation. An aneurism of the abdominal aorta may be distinguished by strong heaving pulsation, bellows murmur, palpitation in the belly, and sympathetic pains in various parts of the body. Hydatid tumours sometimes attain to an enormous size. They may burst into the abdominal cavity, causing severe peritoneal pain, collapse, and death in a few hours; into the intestine, and be evacuated per anum; into the lungs, when their contents are expectorated. These tumours may remain in a state of quiescence for a whole lifetime, but they are a source of constant danger because they may be ruptured by any accidental blow or fall.

Structure of the hydatid tumour.—The tumour (*echinococcus veterinorum*) is formed of a restricted development of a species of tape worm, the *Tænia echinococcus* of Siebold. It is composed of a delicate thin-walled cyst, called the parent cyst, surrounded by a thick-walled dense sac formed partly of an exudation from the parent cyst and partly from a condensation of the hepatic tissue enclosing it. The parent cyst is filled with a clear salt fluid, in which are floating multitudes of delicate spherical secondary cysts varying in size from a pea to an egg. These secondary cysts are called *acephalocysts;* the larger contain fluid and another brood of acephalocysts. The inner surface of many of the acephalocysts presents a finely granular appearance; these granules are readily detached; they are echinococci, and have the appearances represented in Fig. 75.

Fig. 75.



a, Echinococcus with circlet of hooklets retracted. *b*, hooklets. *c d*, E. expanded. *e*, E. imperfectly developed. *f*, E. showing suckers.

The parent cyst and its progeny are very liable to calcareous degeneration, their delicate walls becoming thickened and hardened by milk-white earthy matter.

Treatment.—Hydatid tumours should be tapped as soon as they come near enough to the surface. (See a paper by the Editor, Med. Chir. Trans., vol. xlix.)

MALIGNANT DEGENERATIONS are very apt to occur in the liver. They assume the several forms of scirrhus, medullary sarcoma, and melanosis; and like malignant degenerations of other important viscera are necessarily fatal. They generally occasion a great increase in the size of the organ, and sooner or later produce obstinate jaundice and chronic ascites. The most common of these malignant diseases is the medullary cancer in the form of tumours, varying in size and scattered throughout the substance of the liver. They project from the surface, and can be felt through the attenuated walls of the abdomen.

The treatment is palliative, and varies with the symptoms, and the existing state of the system.

DISEASES OF THE SPLEEN.

The spleen is very liable to congestion; it is sometimes the seat of inflammation, acute and chronic, usually resulting in simple enlargement. It is also liable to waxy degeneration, to tubercular, and to syphilitic deposits. These diseases may be treated under the single head of

ENLARGEMENT OF THE SPLEEN.

SYMPTOMS.—Dull pain in the left side; dyspnœa; dry cough; inability to lie on the right side; loss of flesh; anæmia.

COMPLICATIONS.—Disease of the liver, an unusual tendency to hæmorrhage, dysentery, and scurvy, and to the anamic or cachectic state, known as *leucocythemia* (see p. 262).

CAUSES.—Previous attacks of ague; morbid degeneration, especially the deposit of tubercles; morbid softening; diseases of the liver obstructing the hepatic circulation; enteric fever.

DIAGNOSIS.—By the situation of the tumour in the left hypochondrium, extending, in extreme cases, to the epigastrium, the umbilicus, and the hypogastrium; by the tumour being solid and smooth, generally of an oblong shape, lying beneath the integuments, and moveable. The previous occurrence of ague always affords a probability in favour of the tumour being situated in the spleen.

TREATMENT.—The use of iodine, externally, and iodide of potassium, with tonics, internally; friction, in the absence of pain; gentle aperients and alteratives, and moderation in diet. If the disease have been preceded by ague, bark or quinine.

DISEASES OF THE PANCREAS.

SYMPTOMS.—The symptoms are still more obscure than those of disease of the spleen. Hard cancer is the disease to which this gland is most liable. The enlargement of the pancreas is not readily distinguished from that of the adjoining viscera; and it is obviously very liable to be confounded with organic disease of the pylorus or duodenum. The symptoms generally present are, a deep-seated pain in the epigastrium, nausea, sickness, and emaciation. To these may be added, as of occasional occurrence, constipation or diarrhœa, salivation, and jaundice.

DIAGNOSIS.—When the whole gland is diseased the fact is indicated by fatty stools.

TREATMENT.—The treatment of supposed disease of the pancreas must be so shaped as to meet the urgent symptoms that happen to be present. Fat should be omitted from the diet.

CHAPTER V.

DISEASES OF THE URINARY ORGANS.

1. Diseases of the Kidney.
2. Diseases of the Bladder.

DISEASES OF THE KIDNEY.

NEPHRITIS	Inflammation of the Kidney.
OTHER DISEASES . . .	Of the Kidney.
LITHIASIS	Gravel. Calculus.
HÆMATURIA	Bloody Urine.
ISCHURIA RENALIS . . .	Suppression of Urine.
DIABETES	Immoderate flow of saccharine Urine.
CHYLOUS URINE.	
DIURESIS	Immoderate flow of Urine.

NEPHRITIS—INFLAMMATION OF THE KIDNEY.

VARIETIES.—1. Suppurative Nephritis. 2. Acute Desquamative Nephritis. 3. Chronic Desquamative Nephritis.

1. ACUTE SUPPURATIVE NEPHRITIS.

SYMPTOMS.—Deep-seated pain and tenderness in one or other loin; numbness in the thigh; frequent nausea and retching; more or less irritability of the bladder, and pain on micturition; considerable pyrexia; urine presenting a white finely granular deposit, which on examination is found to consist of pus cells, free or contained in casts of the uriniferous tubes. (See Fig. 34, p. 138.) If an abscess form, it may burst into the pelvis of the kidney, and be discharged by the urethra; or it may point in the loin or groin, which parts previously become full and tender. Free suppuration is accompanied by hectic fever, under which the patient often sinks.

CAUSES.—Morbid conditions of the blood. External violence. Retention of urine. Renal calculi.

MORBID ANATOMY.—Kidneys enlarged, congested, with scattered abscesses, varying in size from a walnut to a hemp-seed. Tubes stuffed with epithelial cells or pus corpuscles. If a calculus have been the cause of the disease, the kidney will probably be found destroyed, and its outer portions converted into the sac of a large abscess which occupies its interior. Calculi usually lie in the pelvis of the kidney, and are the cause of suppurative inflammation of its mucous membrane (pyelitis). They ultimately lead to ulceration of the mamillæ, and degeneration of the entire kidney.

DIAGNOSIS.—Pus, derived from the kidneys, is moulded into tubes. The symptoms of inflammation of the pelvis are great renal pain and irritation, and the passage of large quantities of *free* pus.

TREATMENT.—In the early stage, cupping or leeching of the loin. Hot baths. A brisk saline purge followed by full doses of compound ipecacuanha powder, and acetate of ammonia. In the latter stages, quinine with the mineral acids, or alone, may be given. If the inflammation be due to calculi, we must treat accordingly. (See Renal Calculi.)

2. ACUTE DESQUAMATIVE NEPHRITIS.

SYMPTOMS.—In most cases slight rigor and pyrexia; pain in the loins and legs; headache; in some cases vomiting. In the course of a few days the face becomes pallid and swollen, and the legs at the same time œdematous. Ultimately there is general anasarca.

During the first few days the urine is very scanty, or even suppressed. It is of a dark-brown or red colour from admixture of blood, and loaded with albumen. The pain in the loin persists, and on deep pressure there is much tenderness. Sometimes the pain is severe, and extends down the ureter to the bladder and thence to the testicles and down the inside of the thighs. Nausea and vomiting accompany these symptoms. Inflammation of the serous membranes is very liable to occur during the existence of the febrile symptoms. Sometimes convulsions and coma (grave symptoms of suppression) suddenly supervene.

If the case progress favourably, the quantity of urine increases, and deposits a little cloud of flocculent matter, and the blood disappears. After a week it may become quite clear, and remain of a pale colour and low specific gravity; it constantly contains albumen, the quantity of which is variable. As convalescence approaches, it diminishes to a mere trace, and the quantity of urine increases; sometimes as much as 120 ounces being voided in the 24 hours. The anasarca now gradually disappears, and the patient is ultimately left much emaciated and very weak. If the disease terminate fatally, death is preceded by diminution of the urine, until at last there is total suppression. Death more frequently occurs in the latter stages from chest complications, resulting in apnœa.

CAUSES.—Scarlatina, measles, erysipelas; abuse of alcoholic liquors; suppression of the cutaneous excretions from exposure to wet and cold.

PATHOLOGY.—Excessive functional activity of the kidney, induced by a suppression of the cutaneous excretion, or in the attempt to eliminate certain poisonous matters from the blood. This leads to active congestion and excessive growth of secreting epithelium, the cells of which, being changed in this abnormal process, become at last inadequate for the performance of their own special function—the elimination of the urinary constituents. These, in part, remain in the blood, and give rise to the characteristic symptoms of the disease. Meanwhile the capillaries of the kidney become dilated or even ruptured, and the constituents of the blood escape into the renal tubuli. The blood becomes much impoverished; the albumen and red corpuscles diminish, and the specific gravity of the serum falls from 1030 to as low as 1020 in some cases. But what is of more serious import still, urea accumulates in such quantities in the blood, that its presence may be detected in effusions in distant parts of the body.

The fatal symptoms of urinary suppression are due to the presence of urea in the blood. At first the stomach endeavours to eliminate it, and hence the vomiting; but this vicarious function is insufficient: the poison accumulates, and its action is manifested in the convulsions and coma which terminate life. It is considered by some that urea, as such, has no poisonous influence, and that the terrible symptoms of suppression only come on when this is converted into ammonia.

MORBID ANATOMY. — In death during an acute attack. Both kidneys are found involved. They are enlarged and congested, and of a dark-red or chocolate colour; the structure as firm or a little firmer than natural; the cortex more or less mottled with spots of anæmia and ecchymosed tissue; the medullary cones are uniformly congested.

On minute examination the uriniferous tubuli are found, some crowded with epithelial cells, others filled with blood, giving rise to the ecchymosed spots observed on the capsular surface and in the interior of the gland; in others the clot has become colourless. Here and there blood may be observed effused into the capsule inclosing the Malpighian tufts. The walls of the capillaries themselves are thickened and opaque. The pelvis of the kidney, the ureters, and sometimes the bladder are congested, and there is general congestion of the internal organs and effusion into the serous cavities. The bladder is usually empty. If the disease have continued for a month or more, the kidneys will be found in one or other of the stages of degeneration described under Chronic Desquamative Nephritis.

DIAGNOSIS.—Œdema commencing in the delicate areolar tissue of the eyelids, nymphæ, or scrotum, followed by puffiness of the face and general anasarca; the dark smoky colour of the scanty urine, which is found to deposit blood corpuscles and casts of the uriniferous tubules filled with epithelial cells (Fig. 30, p. 137), are the signs by which acute desquamative nephritis, and its attendant dropsy, may be distinguished from other renal affections, and dropsies dependent on hepatic, pulmonary, or cardiac diseases.

PROGNOSIS.—*Favourable* if the secretion of urine be free, and contain comparatively little blood and albumen. *Unfavourable* if the urine be very scanty and bloody, and if difficulty of breathing come on.

TREATMENT.—I. *Reduce the inflammation*, either by the use ot cupping-glasses, or the application of numerous leeches to the region of the kidney, followed by mustard-poultices.

If there be much febrile action, tartarized antimony, in diaphoretic doses, will be of much service. When pain is a prominent symptom, Dover's powder may be given in combination with the antimony.

II. *Restore the action of the skin.*—The hot bath, or, still better, a hot-air bath, should be given, and acetate of ammonia simultaneously administered, in order to secure copious diaphoresis.

The temperature of the room should be kept above 70° Fahr.

III. *Relieve the action of the kidneys.*—Saline purgatives, in combination with senna or jalap, should be given, so as to keep the bowels freely open. The diet must be restricted to gruel and farinaceous substances. Toast or barley-water may be freely taken.

IV. If symptoms of *suppression* appear, the treatment recommended under Ischuria Renalis (see p. 555) must be adopted.

3. CHRONIC DESQUAMATIVE NEPHRITIS.

SYMPTOMS.—These are insidious, and may long remain unobserved. The disease is a frequent consequence of a slight attack of the acute variety, and we may generally trace back its origin to an indisposition caused by exposure to wet or cold. In many cases it appears to have crept on in consequence of gradual degeneration of the kidney. Many patients present the gouty diathesis, or are actually suffering from a renewed attack when the renal symptoms first appear. Emaciation, and anæmia, with an inclination to swelling of the eyelids and ankles, are the symptoms of debility which induce the patient to apply for relief. On inquiry we shall probably find that micturition is copious and frequent, that the patient is frequently disturbed several times in the night to void urine. In gouty subjects the urine is usually scanty and loaded with lithates, and will be found to contain a variable quantity of albumen and casts of the uriniferous tubules resembling those which have been already described as characteristic of acute desquamative nephritis. The patient may remain in this state for months or even a few years, but at last dropsy comes on and becomes general, the urine decreases, the casts show great degeneration of the epithelial cells, and have a granular appearance (Fig. 31, p. 137); sometimes the cells are altogether absent, the cast itself looking like a film of wax, to which drops of oil are, in the latter stages, observed to adhere. Urea accumulates in the blood; the patient is seized with epileptic fits, which succeed each other in rapid succession, and he finally becomes comatose and then dies.

MORBID ANATOMY.—The kidneys are more or less atrophied and shrunken, weighing sometimes not more than $1\frac{1}{2}$ ounce; the tubuli in part completely denuded of epithelium, and atrophied; the cortex contracted and reduced to a narrow layer covering the bases of the cones, and the Malpighian bodies more closely approximated. Some of the tubuli present dilatations, which, by becoming isolated and further distended, are converted into cysts containing a clear albuminous and often jelly-like fluid. The intertubular tissue has a fibrous appearance. The capsule is generally firmly adherent, and the surface from which it is removed granular. The granulations are composed of aggregations of degenerated tubules lying between the small branches of the renal vein. This condition very much resembles that of cirrhosis of the liver. If the disease have had its origin in gout, the kidneys will be small and atrophied, as in the last stage of chronic desquamative nephritis, but they will present the characteristic appearance described at p. 359.

If the chronic disease be a sequence of the acute variety, we may meet with two other morbid conditions of the kidney, viz., the "large white kidney" and the "red coarse mottled kidney," both of which may be regarded as intermediate stages between the swollen congested kidney, characteristic of the *first* stage of *acute desquamative nephritis*, and the small contracted kidney, the *last* stage of *chronic desquamative nephritis.* The coarse red mottled kidney is found in those who have abused spirituous liquors: it is a mixture of congestion and fatty degeneration, the white spots which mottle the enlarged cortex, and the white lines which streak the pyramids being composed of fat.

PATHOLOGY.—COMPLICATIONS AND TERMINATIONS.—In consequence of the destruction of the secreting epithelium of the kidneys, the blood becomes contaminated with the constituents of the urine. The effects of the circulation of this impure blood are general. 1. The affinity between the growing and secreting structures and the blood is diminished, the capillary circulation is feeble and sluggish, and the heart, in its endeavours to overcome the impediment, becomes hypertrophied and dilated. Failing in its efforts, general anasarca is the result.—2. The gastro-intestinal and pulmonary mucous membranes take on an action vicarious of that of the kidney, and endeavour to eliminate the urinary constituents: vomiting, diarrhœa, and bronchitis are the consequences.—3. The impure blood tends to produce low forms of inflammation in various parts of the body; peritonitis, pleuritis, pneumonia, and if the skin be slightly wounded, erysipelas, may arise as complications at any time. The brain itself is sometimes affected, and fluid containing urea poured out into its ventricles. This is always the ultimate result when death occurs from suppression of urine.

DIAGNOSIS.—For the differential diagnosis of Dropsy, see p. 271. Renal dropsy is known from other varieties: 1. By the absence of long-standing pulmonary, cardiac, or hepatic disease; 2. By the mode of access, appearing first in the face, particularly the eyelids, on rising in the morning, and by slight puffiness of the ankles and scrotum towards evening; and 3. By the condition of the urine, from which the several stages of renal degeneration may be safely inferred. If the tubular casts be composed of epithelial cells in a state of granular degeneration, we may assume that the kidney is in the second stage of degeneration. If the casts be large, and wholly denuded of cells, the degeneration is still further advanced. If these denuded casts contain oil globules, the organ may be regarded as in the last stage of atrophy.

PROGNOSIS.—The prognosis will depend, as Dr. George Johnson has so ably shown, upon the evidence furnished by the microscope as to the condition of the kidney, indicated by casts of the uriniferous tubules, to which reference has been made under Diagnosis. In the early stage of chronic as well as of acute desquamative nephritis recovery may be hoped for in the absence of any serious complications. In the later stages the prognosis is unfavourable. In the intermediate conditions the progress of the disease may, under favourable circumstances, be arrested.

CAUSES.—*Predisposing*. The scrofulous diathesis. It occurs in both sexes, and at all ages. Of seventy-four fatal cases recorded by Dr. Bright, nineteen were under thirty, fifty under fifty, thirteen above fifty, and four above sixty.—*Exciting*. Those of the acute varieties of the disease. The impure air, and other unwholesome influences to which the poor inhabitants of large towns are exposed; intemperance; mechanical injuries; cold; a previous attack of scarlatina, followed by dropsy; rheumatism; gout.

TREATMENT.—*Relieve the congestion of the kidney, and the attendant dropsy*, by purgatives and diaphoretics, diuretics being inadmissible. In the absence of diarrhœa, a drastic purgative, such as a full dose of the compound jalap powder, may be given every morning; at the same time five or ten grains of Dover's powder may be occasionally prescribed to act upon the skin. When there is much debility, stimulant diaphoretics, such as the liq. ammon. acet. in doses of ʒii to ʒiv three or four times a day, are indicated. The warm bath, or the hot-air bath, may be used at intervals of one, two, or three days. The skin should be kept warm.

To improve the health.—A nourishing and unstimulating diet should be prescribed; and preparations of steel, of which the tinctura ferri perchloridi (in doses of ♏ xx or ʒss) is the best.

In the treatment of complications, pathology of the disease must be duly regarded; vomiting may be checked, but purging, we must remember, is a natural safety valve, and we must do no more than restrain it, if it become immoderate. If the œdema of the legs increase, and the skin become painfully tense, much relief will be afforded by acupuncture, or slight incisions made on the outside of the legs.

PROPHYLAXIS.—Temperance, pure air, a warm, dry climate, plain and wholesome diet, and regular exercise, are needful for persons who have had, or who seem liable, to nephritis.

OTHER DISEASES OF THE KIDNEY.

The kidney, in common with other vascular organs, is liable to many other forms of disease. Some of these may affect the kidney alone; others are associated with similar disease of the neighbouring viscera.

So long as one kidney only is affected, the urinary function is unimpaired, the healthy organ becoming hypertrophied and performing double duty. The following are the diseases most commonly met with:—

I. *Cystic diseases.*—Cysts in the kidney, varying in size from a mustard-seed to a marble, are of very frequent occurrence in the cortical part of the kidney. The atrophied kidney of chronic nephritis, very commonly presents a large number of minute cysts. It is sometimes enlarged and lobulated, and converted into a few large cysts filled with glairy fluid, the intervening secreting structure being destroyed. There can be little doubt that these cysts are formed by obstruction and obliteration of one part of the denuded uriniferous tubules, while other portions are distended into cysts by the secretion of albuminous fluid.

When an ureter becomes obstructed or obliterated, at first urine, and then a watery fluid, continues to accumulate in the pelvis of the kidney, the secreting structure being slowly absorbed by the pressure, and the whole organ finally converted into one large cyst. A similar change may result from an impediment to the flow of urine from the bladder, the ureters becoming dilated to the diameter of the small intestine. The term *hydro-nephrosis* has been employed to indicate the presence of such cystic tumours of the kidney.

The kidney is liable to morbid changes resembling those which commonly affect the ovary and give rise to ovarian dropsy. In one case which came under my notice, the symptoms were so precisely similar that the case was treated throughout for ovarian disease, the abdomen being uniformly and excessively enlarged, dull, and distinctly fluctuant on percussion. After death both ovaries and the other genital organs were found perfectly healthy, and had contracted no adhesions with the tumour. This, which weighed forty-five pounds, was contained within a smooth-walled cyst; the ureter and upper end of the left kidney were directly continuous with the smooth wall of the tumour. There were two principal cysts, which contained together nine pints of fluid,—colourless in one of the cavities, and dark-brown in the other. The right kidney was healthy and hypertrophied. This patient had had two children; her age was thirty-four. Another case, presenting exactly the same symptoms, and, generally, the same morbid appearances in connection with the left kidney also, occurred at the Stockport Infirmary during my residence there. The subject was a little girl about seven years of age. The abdomen was greatly distended as if by the gravid uterus. The age of the patient somewhat simplified the diagnosis; a tumour of the uterus it could hardly be, and ovarian disease seemed just as improbable; but yet from the uniformity of the swelling which had commenced in one iliac region, its fluctuation, and the absence of any urinary symptoms, most of those who formed a positive diagnosis concluded that it was ovarian.

II. *Fatty degeneration* (*the granular kidney*).—This is the condition to which the atrophied kidney of desquamative nephritis tends. The glands are large and pale, the cortex is anæmic, and mottled with opaque granulations of a yellowish-white colour, giving a granular appearance to the kidney. On minute examination the granulations are found to be composed of fat, and the convoluted tubuli are lined with dark opaque cells composed of fatty molecules and drops of oil (Fig. 8, p. 83).

The early symptoms are those of desquamative nephritis; afterwards the pale albuminous urine is rather scanty and quite clear, occasionally depositing a little cloud of small waxy casts, in which minute globules of oil are found adhering.

III. *Albumenoid* (*waxy*, *lardaceous*, *amyloid*) *degeneration*.—The kidney, in common with other glands, is liable to this form of disease. The gland is usually increased in size; it is hard, and cuts firm; the surface of the section is smooth, homogeneous, and of a waxy appearance. The minute structure of the degenerate tissue is that already described under Albumenoid Degeneration of the Liver. (See p. 540.) This condition of the kidney appears to be derived from the "large white kidney," found in the second stage of acute nephritis. Perhaps the scrofulous diathesis, with which the albumenoid kidney is most frequently associated, determines the particular pathological condition into which the large white kidney may branch. The term "*albumenoid*" is selected to designate this form of degeneration, because the morbid material is of the nature of albumen. "*Lardaceous*" and "*waxy*" are only appropriate in so far as they refer to appearances. The term *amyloid* is exceedingly inappropriate.

The symptoms of the disease are those of chronic desquamative nephritis.

IV. *Tuberculous and cancerous* deposits occur in the kidney, associated with similar disease elsewhere, rarely or never alone. They form at first isolated rounded masses, which tend to become confluent and soften in the centre, and being discharged with the urine, may be identified, and the condition of the kidney inferred therefrom.

V. *Hydatid tumours* of the kidney are uncommon.

LITHIASIS—GRAVEL AND CALCULI.

SYMPTOMS.—Dull or acute pains, with a sense of heat and heaviness in the loins; with more or less pain or difficulty in voiding urine, increased by sudden and violent motion, with occasional pain behind the pubes; irritation at the neck of the bladder, and itching or pain at the end of the penis. Sometimes there is retraction of the testicles, with discharge of bloody urine, or of clots of blood. The urine, even while warm, contains a sandy powder, crystalline grains, or small calculi. It is generally rather scanty, high-coloured, of high specific gravity, acid, of a strong odour, and becomes turbid on cooling. The digestive organs are deranged, and the patient suffers from ascidity, flatulence, and frequent eructation; constipation; furred tongue; dry skin; restlessness; and feverishness.

The most common form of gravel consists of urate (lithate) of ammonia, with or without free uric acid (*red gravel*). Next in point of frequency, is pure uric acid. The ammoniaco-magnesian phosphate, or a mixture of this with amorphous phosphate of lime (*white gravel*) comes next in order; then the oxalate of lime. These deposits may co-exist or alternate with each other. When the deposits become aggregated to form small calculi, the symptoms are much more severe. (For the mode of distinguishing these several varieties see pp. 126, *et seq.*)

The symptoms of *calculus in the kidney* are those of gravel in its most severe form, viz., pain in the loins, extending to the groin, testicle, or extremity of the penis, retraction of the testicle, painful and frequent micturition, and bloody urine. Nausea and vomiting, restlessness, and slight fever. These symptoms are often suddenly removed by the discharge of a small calculus, accompanied or not by that of a large deposit of gravel. If the calculus remain in the kidney, it often leads to severe suppurative inflammation (*pyelitis*), and its complications (p. 544).

The symptoms of *Calculus in the Ureter.*—When a calculus is passing along the ureter, there are paroxysms of intense pain (a fit of the gravel), or a dull pain along the affected ureter and spermatic cord on the same side, extending to the penis, the testicle, or the inside of the thighs. There is frequently great tenderness in a circumscribed part of the abdomen, corresponding with the seat of the calculus. The patient is troubled with constant and often ineffectual calls to pass urine, which is tinged with blood. There are severe nausea and vomiting, and intense suffering. These symptoms may pass off suddenly, as soon as the calculus reaches the bladder, followed, in some cases, by its discharge from the urethra. In other instances, the calculus remains impacted in the ureter, leading to disease of the kidney, or giving rise to large accumulations of urine, with distension of the ureter, of the pelvis, and even of the walls of the kidney itself. The kidney thus enlarged has grown to such a size as to fill the abdomen (*hydro-nephrosis*), and be mistaken for ascites.

The symptoms of *calculus in the bladder* are, frequent desire to pass water; during its passage a burning sensation at the orifice of the urethra; sudden interruptions of the stream, accompanied by great forcing and intolerable pain; after lying on the back the urine again flows; the discharge of the last ounce is attended with excruciating pain, caused by the contraction of the bladder upon the stone; frequently there is numbness and tormenting pain down the inside of the thigh. After violent exercise, or long continuance of the symptoms, the urine becomes purulent and bloody from inflammation of the mucous membrane of the bladder.

CAUSES.—*Predisposing.* Childhood, and from the age of forty upwards; high living; sedentary habits; rheumatic and gouty diathesis.—*Exciting.* Cold; blows and injuries to the loins; parasites (p. 554); dyspepsia; the use of water containing calcareous matters. In the case of the oxalate of lime gravel, an excess of saccharine matters, and vegetables and fruits containing oxalic acid; organic disease of the kidney or bladder.

TREATMENT.—This varies with the species of gravel discharged.

In *uric lithiasis* a diet chiefly vegetable, and in extreme cases entirely so, with total abstinence from fermented liquors and wines. Diluents; the bicarbonate of potash (Form. 295), and salts of lithia (Form. 294), taken in a tumbler of cold water an hour before meals, three or four times a day, so long only as the urine has an acid reaction. The alkaline aërated waters of Vichy and Carlsbad.

In *phosphatic lithiasis* a more generous diet is admissible, with a moderate allowance of wine, and the mineral acids (the nitric, muriatic, or nitro-muriatic acid), should be given at short intervals. When the phosphatic diathesis has been brought about by exhaustion of mind or body, opium very often proves very serviceable.

In *oxalic acid lithiasis*, mineral acid. All articles of food containing oxalic acid should be avoided, and saccharine substances should be taken in moderation, or, in extreme cases, disallowed. The patient should use soft water.

In all forms of gravel, strict attention must be paid to the general health; to the functions of the skin and bowels, and to the state of the digestive organs. Warm bathing is beneficial by promoting the action of the skin.

In the treatment of renal calculi, our efforts must be directed to relieve pain and facilitate the passage of the calculus. The medical treatment of *calculus in the bladder* will depend upon the nature of the gravel voided by the patient.

HÆMATURIA—BLOODY URINE.

SYMPTOMS.—An evacuation of blood in the urine.

CAUSES.—Congestion of the kidney, or of any part of the mucous membrane of the urinary organs, idiopathic, or produced by cantharides, turpentine, &c.; nephritis; calculus in the kidney, ureter, bladder, or urethra; blows on the loins; diseased prostate; chronic inflammation or ulceration of the mucous membrane of the bladder; villous tumours or malignant fungous growths from the mucous membrane. Sometimes hæmaturia occurs in the course of purpura nautica, or purpura hæmorrhagica, typhus and scarlet fevers. The strongylus gigas, a nematoid worm, is a rare cause of hæmaturia. In the West Indies, Egypt, the Mauritius, Natal, and Cape of Good Hope, hæmaturia is endemic, and it has been traced in some of these countries to the presence of animal parasites in the urinary organs.

DIAGNOSIS.—Bloody urine is of a bright-red or dark-brown colour, and if the quantity of blood be considerable, a dark-brown deposit, or distinct coagula are formed. For the chemical and microscopical characters, see p. 134. When the secretion is acid, and the blood in very small quantity, the urine has a smoky appearance.

The source from which the blood flows may sometimes be inferred from the accompanying symptoms, and a careful examination of the urine. If the hæmorrhage be preceded by pain in the region of the kidney, if the blood be equally diffused through the urine, and if it contain casts of the urinary tubes (see p. 137), the blood is from the kidney. When the first quantity of urine discharged from the bladder is little, if at all, tinged with blood, and the remainder consists of blood, or urine highly tinged with blood, there is a strong presumption that the hæmorrhage is from the bladder, especially if symptoms of stone are present. When the blood flows without discharge of urine, it is derived from the urethra.

TREATMENT.—Must be determined by the probable cause of the hæmorrhage. If the disease be the consequence of injury, or the patient be of a full, plethoric habit, cupping of the loins, rest, and gentle aperients will be required. If it arise from irritation of the kidney by calculus, together with the remedies proper for that disease, frequent draughts of mucilaginous liquids, as thick barley-water, solution of gum acacia, decoction of marsh-mallows sweetened with honey, opium, and copious emollient clysters should be prescribed. If the blood coagulate in the bladder, and give rise to difficult micturition, the catheter must be used, and injections of warm water, decoction of marsh-mallows, or of poppies, be resorted to.

When the hæmorrhage is excessive, cold water, or a cold solution of alum (℥j–Oij) may be injected into the rectum. At the same time the vegetable astringents (Form. 170, 172) may be given by the mouth. Acetate of lead with opium, and tinctura ferri perchloridi are suited to the anæmic.

ENDEMIC HÆMATURIA.

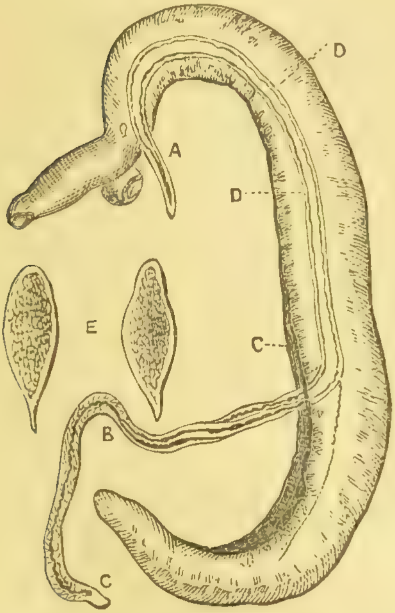
One of the above-mentioned causes of hæmaturia is so widely prevalent amongst the inhabitants of certain regions that it requires separate consideration. The disease is known to be endemic in the West Indies, in Egypt, in the Mauritius; and I have lately (Med.-Chirurg. Trans., 1864) called attention to its existence in Natal and the Cape of Good Hope, at Uitenhage and Port Elizabeth.

Dr. T. Bilharz, of Cairo, has shown that the hæmaturia and gravel (lithiasis) so common in Egypt is due to the presence of a nematoid worm, variously termed Distomum hæmatobium, Gynæcophorus hæmatobius, and Bilharzia hæmatobia. It is a minute white worm, less than half an inch long. In Fig. 76, the female (A B C D) is represented partly lying within the gynæcophoric canal of the male (C); the eggs (E) are considerably magnified. The parasite inhabits the veins of the urinary and portal systems, but more commonly those of the former, causing much congestion and hypertrophy of the mucous membrane of the bladder, ureter, and pelvis of the kidney.

The hæmaturia of the south-east coast of Africa is due to the same or a closely-allied species of parasite. Only the eggs and ciliated embryo (Fig. 77) are at present positively known. There can be little doubt that the disease prevalent in the Mauritius is due to the same animal.

The cause of endemic hæmaturia of the West Indies remains to be discovered.

Fig. 76.



SYMPTOMS.—The symptoms of the disease prevalent in South Africa and the Mauritius are the following:—The passage, with the last ounce of urine, of a little blood, rarely exceeding a teaspoonful; or bloody, or colourless mucus, moulded so as to resemble "veins." These latter sometimes cause a little obstruction, and give rise to straining. When the parasite inhabits the kidney, an occasional smart twinge of lumbar pain is felt. The urine is clear and pale-coloured, the blood being rarely or never diffused through the bulk of it. After exertion, the quantity of blood is increased. During the earlier years of the disease no other pain or inconvenience is experienced. The disease attacks both sexes at about the age of ten. My friend, Mr. Dunsterville, of Port Elizabeth, informs me that two out of every three schoolboys are affected, and their linen is commonly blood-stained like that of the other sex from the menstrual discharge.

Adults, and occasional residents of certain localities in the Cape and Natal, are also liable to the attacks of the parasite.

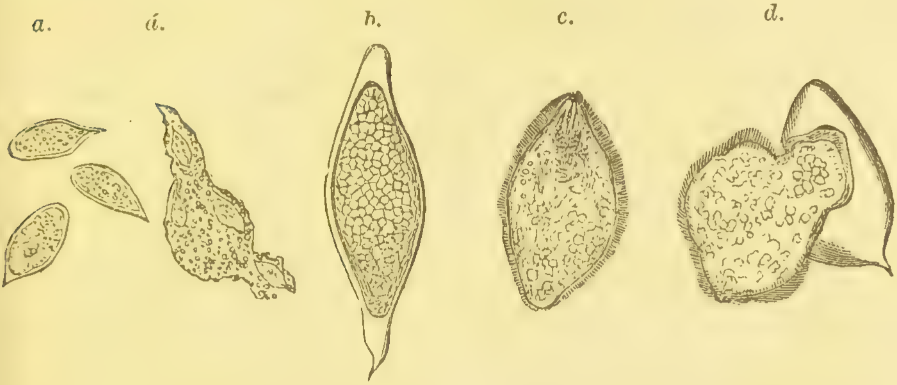
After a few years the hæmaturia gradually declines, and, as a rule, entirely disappears at the age of puberty; but the cause, as manifested by the presence of ova in the urine, persists, and sooner or later gives rise to severe symptoms of gravel. The urine assumes a highly saline condition, and crystalline deposits, chiefly composed of oxalate of lime, form around the ova which the parasite produces in great abundance. The eggs thus become the nuclei of renal calculi.

DIAGNOSIS.—The presence of the characteristic ova *a b* (Fig. 77), in the urine. They measure the $\frac{1}{170}$th of an inch long, and the $\frac{1}{400}$th broad, and are strongly acuminated. The colourless or bloody mucus casts, *á*, frequently contains scores of these ova. Occasionally the ciliated embryo *c* may be observed escaping from the egg *d*.

CAUSE.—The introduction of the parasite in an early stage of development into the stomach by means probably of water, or of certain water plants or salads.

PROPHYLAXIS.—The use of filtered or boiled water, and prevention of the contamination of the streams by the urinary products of individuals suffering from the disease.

Fig. 77.



TREATMENT.—This must be directed: I. To kill or expel the adult sexual parasites. II. If our efforts to do so be unavailing, to secure the regular expulsion of the ova which, so long as they remain in the body, may at any time become the nuclei of urinary calculi. The success which attends the treatment of intestinal parasites leads one to hope that some specific may be found against the Bilharzia which in its after consequences is a most painful, and sometimes a dangerous associate. To get rid of the parasite, which is not simply attached to the surface of the mucous membrane, but lies within orifices of the smaller veins, we must introduce into the blood a remedy poisonous to the parasite. Atropia and hyosciamia are two principles which are solely eliminated by the kidney, and it appears very probable that a persevering use in belladonna and henbane would retard the development of the parasite even if it did not result in its destruction. These remedies are at the same time most beneficial in allaying the irritation from the crystalline deposits which form around the ova.

ISCHURIA RENALIS—SUPPRESSION OF URINE.

SYMPTOMS.—Languor, restlessness, weariness and weight in the loins and legs, frequent pulse, heat of skin, flushed face, headache, nausea, and vomiting. About the third day drowsiness and œdema of the face, or general anasarca, follows. Some hours afterwards epileptiform convulsions, often very violent and frequent, come on, and after three or four attacks the patient falls into a state of profound coma, and dies. At the onset, a small quantity of muddy urine may be voided; but when the disease is fully formed, there is *anuria* or complete suppression.

In some cases, there is neither pain in the loins nor fever, but only slight nausea and drowsiness. During the second or third day the patient becomes comatose, and dies in from 24 to 30 hours. In some cases, the suppression is a consequence of retention of urine in the kidney from obstruction of the ureters, and in these the disease sets in with excruciating pain, which at length subsides; and the patient becomes drowsy and dies comatose.

CAUSES.—Chronic disease of the kidney, aggravated by exposure to wet and cold. The action of certain poisons, as digitalis, arsenic, corrosive sublimate, and cantharides. Acute inflammation of the kidney. Mechanical obstruction in the ureters. The infectious fevers.

DIAGNOSIS.—From *retention of urine* by the empty state of the bladder as ascertained by the hand, or the catheter.

PROGNOSIS.—*Unfavourable* in chronic disease of the kidney; *more favourable* when it occurs in acute disease.

TREATMENT.—*Indications.* I. Promote the elimination of urea by copious purging and diaphoresis; gr. i of elaterium, or ♏ii of croton oil should be given immediately, and the patient exposed to a hot-air bath. The function of the kidney may be aroused by the injection of the $\frac{1}{96}$th of a grain of atropia beneath the skin.

II. If acute nephritis be present, ℥x or ℥xx of blood may be taken from the arm, or the loins may be cupped or leeched, and hot stimulating fomentations subsequently applied.

When other means fail, powerful diuretics, such as cantharides and turpentine, may be administered.

III. The head symptoms must be treated by blisters to the forehead and nape, and if the head be hot by a bladder of ice to the vertex.

DIABETES—IMMODERATE FLOW OF SACCHARINE URINE.

SYMPTOMS.—That which first attracts attention is frequent micturition. The urine is excessive in quantity, of a pale straw colour, of a peculiar faint odour resembling hay, has a sweet taste, and contains more or less sugar. There is inordinate appetite, excessive thirst, and constipation, the stools being dry and hard. The tongue is clammy, and red at the edge, or clean, or white with a brown streak down the middle; the gums are red and tender; the throat dry; the breath has often a sweetish odour, like that of hay; and the skin is dry and harsh. The patient is weak, and loses flesh; and becomes anxious, sad, and irritable. After the disease has continued for some months, or even for several years, the symptoms continuing to increase, the emaciation becomes extreme, and the patient either dies of exhaustion or phthisis.

In some cases the sugar disappears from the urine and reappears after a variable interval. Sugar is frequently present in small quantity in the urine of old people, without producing injurious effects.

PATHOLOGY.—M. Bernard has demonstrated the following facts:—

I. That in a recently killed animal, sugar invariably exists in the blood of the hepatic veins, and is absent from that of the portal veins. II. A substance (*glycogen*) may be artificially separated from the liver, which under the influence of saliva, pancreatic fluid, blood, liver tissue, &c., gives the reactions of grape sugar. III. Glycogen is formed with equal facility and abundance when the food consists of nitrogenized matters only, saccharine or starchy articles of diet being unnecessary for its production.

From these facts Bernard infers that sugar is formed in the liver during healthy assimilation; that it passes out of it into the blood of the hepatic veins; and is carried to the lungs, where it undergoes oxidation and conversion into carbonic acid and water, eliminated as such from the lungs.

According to this theory, the liver and lungs have a reciprocity of function in the generation and destruction of sugar; and the most obvious explanation of the appearance of sugar in the urine is, that the reciprocal actions of these two great glands become disproportionate the one to the other. Thus, under certain abnormal conditions, the liver may generate a larger amount of sugar than could be destroyed in a single circulation through the lungs, and sugar enters the general circulation, and is separated by the kidneys. Again, when only a normal quantity of sugar is separated by the liver, disease or functional derangement of the lungs may render these organs inadequate to perform their sugar-destroying function, and thus also the saccharine matter would pass into the general circulation.

But according to Dr. Pavy, glycogen is not normally converted into sugar in the liver. He supposes that it ought to be converted into fat, and that it is only when the function of the liver is disturbed as in diabetes, that it undergoes metamorphosis into sugar. He believes that this metamorphosis is the result of changes which commence immediately after the death of the animal. He bases this conclusion upon a frequently repeated observation, that the blood of the right side of the heart of a living animal contains only that trace of sugar which can be found in the left side of the heart. It appears, then, that we must look on the generation of sugar in the liver as a result of derangement or perversion of its function. Amongst the causes of this specific derangement are irritations of the pneumogastric nerve and brain. Thus Dr. Bernard induced diabetes by irritating the pneumogastric nerve at its origin in the floor of the fourth ventricle; and Dr. George Harley by the irritation of the peripheral branches of the same nerve. Dr. Goolden observed that diabetes was a frequent result of blows on the head; and we have had several opportunities of convincing ourselves of the accuracy of his observations.

MORBID ANATOMY.—The kidneys vascular and hypertrophied; occasionally presenting granular degeneration. Tubercular deposit in the lungs; shrunken condition of the brain.

COMPLICATIONS AND SECONDARY DISORDERS.—Pulmonary phthisis (the most common complication); granular degeneration of the kidney; peritoneal inflammation; anasarca; apoplexy.

PROGNOSIS.—*Favourable.* The intermittent form of the disease; a short previous duration; urine not exceeding 12 pints in quantity and 1036 in density; the emaciation not considerable; the appetite and thirst not inordinate; the skin still soft and moist; and the mind not much depressed. When the patient is under treatment, the signs of improvement are, a decrease in the quantity of the urine, without increase of density, steady diminution in the quantity of solids discharged, increase of weight, strength, and activity, diminished appetite and thirst, the mind becoming clearer and more cheerful.—*Unfavourable.* Prolonged duration of the disease, great emaciation, and rapid diminution of strength; the supervention of pulmonary or renal disease, great and sudden prostration of strength.

CAUSES.—*Predisposing.* Hereditary tendency.—*Exciting.* Intemperance; abuse of the sexual function; injuries of the head.

DIAGNOSIS.—Excessive diuresis; 8 gallons of urine are sometimes voided in the 24 hours; 2 gallons is about the quantity usually excreted. The specific gravity is very high, ranging between 1030 and 1070. It is sweet to the taste, and after evaporation leaves a white powder or sticky residue—sugar. The quantity of this substance passed in the 24 hours varies from half a pound to three pounds. For the mode of detecting sugar in the urine, and of ascertaining its quantity, see p. 132.

TREATMENT.—I. The diet should consist chiefly of animal food, broiled or roasted, with a small quantity of stale and well-fermented bread; and liquids in moderate quantity: of which the best are weak beef or mutton tea, milk, pure spring water, or water holding calcareous salts in solution. Gluten and bran bread may be substituted with advantage for common bread. The liver indeed readily converts albuminous substances into sugar; but when the diet is restricted to azotized food, the sugar decreases.

II. The quantity of liquid must be limited, and the use of spirituous liquors, saline aperients, and all articles of diet or medicine which have diuretic properties, avoided. The secretion of the skin may be assisted by warm baths, friction, and warm clothing; by opium in small and repeated doses, as five grains of Dover's powder three times a day.

III. The intense thirst is best relieved by iced water acidulated with phosphoric acid. Claret is a suitable drink.

IV. The strength must be supported, and the disease kept in check by the administration of ♏xx–♏xl tincturæ ferri perchloridi twice or thrice a day: and a full dose of opium at bedtime every other night. Constipation should be relieved by resinous purgatives; and debility, when extreme, by tonics and stimulants.

In one case that was under my care, a young female continued for months to pass large quantities of saccharine urine without losing flesh or suffering in health. She took no medicine, except a simple tonic infusion, and continued, though not very strictly, a diet containing an excess of animal food. It is evident that no part of the sugar was formed at the expense of the structures of the body. So long as a patient does not lose flesh, it is probably inexpedient to adopt any other treatment. (G.)

CHYLOUS URINE.

Symptoms.—The passage of opalescent or milk-like urine. Sometimes it has a faint pink tinge from the presence of blood. Occasionally the urine coagulates in the bladder and gives rise to retention. Otherwise the symptoms are very slight. In aggravated cases, debility, loss of flesh, and pain in the loins constitute the general symptoms.

The urine is generally abundant, of a milky appearance, and varying in density from 1010 to 1020. After its discharge it sometimes coagulates into a white gelatinous substance, like blanc-mange, taking the form of the containing vessel. It more frequently retains the fluid condition, and separates after some time into a clear yellowish fluid and a white clot; at other times a white flaky matter is deposited; or a white cream rises to the surface. The opalescence is due to fatty matter in the molecular condition; small granular cells resembling chyle corpuscles, and sometimes a few red blood corpuscles are also observed. On analysis, the urine furnishes, in addition to its normal constituents, fat and albuminous matter.

The disease is rare in temperate regions; but prevails endemically in the East and West Indies, Brazil, the Mauritius, and Bourbon.

Treatment.—Does not admit of removal; but it may be palliated by gallic acid, and the astringent chalybeates.

Pathology.—Dr. H. V. Carter (Trans. Med. and Physl. Soc., Bombay, 1861) concludes that the chyle, by rupture of the walls of dilated lymphatic vessels, obtains direct entrance into some part of the urinary passages. In three of his cases there was an accumulation of milky chyle in the enlarged inguinal glands. A very close connection appears to exist between hæmaturia and chylous urine. The diseases frequently coexist (Rayer), and Dr. Priestley relates a case ("Med. Times and Gaz.," April 18, 1857), in which the chylous urine was associated with hæmaturia in a native of the Cape of Good Hope. Further, hæmaturia and chylous urine are both endemic, *and both prevail in the same localities.* From what we know of parasitic hæmaturia (pp. 552, *et seq.*), it may therefore be inferred that in many cases at least of chylous urine, the communication between the lacteal and urinary channels is effected by the burrowing of parasites. In the last-mentioned case Bilharzia was probably the cause of communication.

DIURESIS—IMMODERATE FLOW OF URINE.

The passage of large quantities of watery urine is a direct result of the excessive use of fluids, especially of spirituous liquors. It also occurs during functional irritation of the kidney, at the end of the hysterical fit, and after other mental agitation.

The term chronic diuresis is used by Dr. Watson to designate the condition which has been confusedly named *Diabetes insipidus.* The disease, or rather symptom of disease, consists in the excretion of large quantities of urine only differing from that of health in containing more water, or more or less urea than normal. These variations have been significantly termed by Dr. Willis, *hydruria*, *azoturia*, and *anazoturia*, respectively. When the urea is in excess the specific gravity of the urine is unusually high. In the other varieties it is exceedingly low. The diuresis is commonly associated with thirst, and some disorder of the digestion.

The treatment must be directed to the regulation of the cutaneous and gastric functions.

DISEASES OF THE BLADDER.

Cystitis	Inflammation of the Bladder.
Enuresis	Incontinence of Urine.
Dysuria	Difficulty in voiding the Urine.

CYSTITIS—INFLAMMATION OF THE BLADDER.

1. ACUTE CYSTITIS.

Symptoms.—Pyrexia; acute pain, swelling, and tension in the region of the bladder; pain and soreness, increased upon pressure above the pubes, or in the perineum; frequent micturition; painful discharge of urine, in small quantities, or complete obstruction to its passage; tenesmus; vomiting.

Causes.—Mechanical injury; falls on the abdomen when the bladder is distended; local irritation by calculi; gonorrhœal inflammation extending along the urethra; spasmodic or permanent stricture; all the usual causes of inflammation; cantharides; stimulant urethral injections; cold (*catarrhus vesicæ*).

Treatment.—Leeches to the perineum, followed by a hot bath and fomentations, a brisk saline purgative combined with a full dose of opium.

The condition of the urine must be carefully determined. If it be hyperacid, alkalies; if alkaline, acids, with opium, should be given.

2. CHRONIC CYSTITIS—CYSTORRHŒA.

Symptoms.—The discharge of an increased quantity of mucus with the urine, with slight symptoms of inflammation of the bladder.

Causes.—Diseases of the prostate gland, urethra, ureters, or kidney. Stone in the bladder. Ulceration or fungus of the organ. Retention of the urine in cases of paralysis due to spinal disease. Obstruction to the flow of urine out of the bladder.

If the urine remain long in the bladder it undergoes decomposition; the urea assimilates four equivalents of water, and is converted into carbonate of ammonia, which sets up chronic inflammation, and the urine becomes bloody, and highly offensive.

PROGNOSIS.—*Unfavourable* in the aged and intemperate, especially when associated with paralysis, or renal disease.

TREATMENT.—In simple cystorrhœa the use of uva ursi, bucco, pareira, cubebs, copaiba, black pepper, combined with mineral acids. The irritability of the bladder is relieved by emollient injections, such as decoction of marsh-mallows with laudanum, and by hot fomentations. The feet should be kept warm, and the patient ought to be protected against cold.

If the urine be ammoniacal, bloody, offensive, and loaded with mucus, the bladder should be frequently washed out by means of the double-channeled catheter, with warm water slightly acidulated with hydrochloric or nitric acid. In cases of paralysis, the urine should be drawn off at least twice a day.

ENURESIS—INCONTINENCE OF URINE.

Incontinence of urine may arise from mechanical causes, or from functional derangements of the bladder. The latter class alone comes within the province of the physician.

CAUSES.—Incontinence of urine, without organic defect, may arise from one of two causes: from violent contraction of the bladder, the sphincter possessing its usual power; or from relaxation of the sphincter, the bladder retaining its normal contractile power. In the first case, there is generally some source of irritation within the bladder itself, the urine being hyper-racid or containing acicular crystals of uric acid; but in rare instances the muscular fibres are thrown into a state of spasm without obvious cause. The first form of disease is most common in males; the second in females and children.

TREATMENT.—In incontinence arising from spasm of the bladder, the most effectual remedies, in the absence of gravel, are narcotics or sedatives, administered by the mouth, or introduced into the rectum, in the form of suppository or enema. A grain of solid opium as a suppository, or half a drachm of laudanum in a starch injection, will generally succeed in relieving the spasm. If lithiasis be the cause of the incontinence the remedies appropriate for that condition must be employed. (See p. 552.)

In incontinence arising from debility of the sphincter, two or three drops of tincture of cantharides, with ten drops of tincture of hyoscyamus, increased gradually and cautiously, rarely fail of removing the disease. I have had several cases of this kind, which have received immediate benefit and a speedy cure from this mode of treatment. In one case, occurring in a young adult, after cantharides had failed, tinctura ferri perchloridi in the dose of ʒss three times a day effected a speedy cure. (G.)

In many cases the urine is perfectly retained during the day, and voided only at night. These will require the same treatment.

DYSURIA—DIFFICULTY IN VOIDING THE URINE.

Dysuria may exist in every degree, from slight and momentary arrest of the flow of urine, with or without pain, to complete retention. Some degree of pain generally attends the abortive attempts to discharge the urine, and in severe cases the suffering is intense.

Causes.—Long retention or acidity of the urine; irritation or inflammation of the coats of the bladder. Gonorrhœa inflamed prostate, gravel, urinary calculus, cystitis and nephritis, inflamed hæmorrhoids, inflammation or irritation of the rectum, uterine affections, pregnancy, &c. *Strangury*, an aggravated form of dysuria, is produced by cantharides and other strong irritants. Dysuria is also a symptom of hysteria, and may occur in nervous persons of both sexes. The mechanical causes are stone in the bladder, stricture of the urethra, abscesses in the perineum, prostatic tumours, displacements of the uterus.

Treatment.—This must depend on the cause. Of those external to the bladder, constipation is the most common; and a brisk purgative, or a proper course of aperients, will soon remove the disease.

Spasm of the muscular coat requires the use of the warm bath with opiate suppositories or enemata. When the spasm is of frequent occurrence, tincture of the muriate of iron in repeated doses.

When the urine is scanty and acid, alkaline diuretics, and diluents will be required. Dysuria following long retention of urine is best relieved by the warm bath.

CHAPTER VI.

DISEASES OF THE ORGANS OF GENERATION.

AMENORRHŒA.
DYSMENORRHŒA.
MENORRHAGIA.
LEUCORRHŒA.
METRITIS.
ULCERATION OF THE OS AND CERVIX UTERI.
CANCER OF THE UTERUS.
FIBROUS TUMOURS OF THE UTERUS.
PELVIC HÆMATOCELE.
DISPLACEMENTS OF THE UTERUS.
OOPHORITIS.
OVARIAN TUMOURS.
GONORRHŒA.
SYPHILIS.
SPERMATORRHŒA.

AMENORRHŒA—ABSENCE OF MENSTRUAL DISCHARGE.

SPECIES.—1. Amenorrhœa from organic deficiency. 2. Amenorrhœa from functional derangement.

1. ORGANIC AMENORRHŒA.

CAUSES.—Absence of the ovaries; disease or defective development of the ovaries; absence or defective development of the uterus or vagina. Treatment, with a view to the establishment of the function, is of course useless in such cases.

2. FUNCTIONAL AMENORRHŒA.

VARIETIES.—(*a.*) Primary suppressed menstruation. (*b.*) Amenorrhœa with plethora. (*c.*) Amenorrhœa with anæmia or chlorosis.

(*a.*) PRIMARY SUPPRESSED MENSTRUATION.

The age at which menstruation begins is very variable. In this country the discharge may appear as early as the tenth year, or as late as the twentieth. In the greater number of young women it comes on between the ages of fifteen and sixteen.

The discharge is preceded in most cases by the following symptoms: A little languor, flushing of the face, throbbing headache, and aching pain in the loins. In some cases these symptoms are attended with well-marked pyrexia. After a few hours an oozing of thin non-coagulable dark-coloured blood of acid reaction appears. It continues for a variable period, usually three or four days, and then ceases, the whole quantity discharged being usually about six ounces.

In many cases the menstrual nisus occurs and recurs with increasing severity every month without any appearance of the sanguineous discharge. Such are cases of primary suppressed menstruation.

TREATMENT.—When the above-mentioned symptoms come on, a brisk aloetic purge, followed by Form. 295, and a hot hip-bath. Strict attention must be paid to the general health in the intervals. Moderate exercise should be taken. Fatigue and exposure to cold and wet must be avoided.

In the *chronic* form the menstrual nisus is absent, and the general health is delicate. In such cases we may give chalybeate tonics, combined with stimulants, to improve the general health, and at suitable periods we may endeavour to elicit the menstrual flow by the exhibition of emmenagogues. (Form. 318.) If these fail, we may try electricity. The best emmenagogues are the remedies and modes of treatment which tend to restore the health and strength of the patient.

(*b.*) AMENORRHŒA WITH PLETHORA.

The general symptoms and constitutional treatment are those of plethora. (See p. 257.) When blood is abstracted, it should be taken away at the approach of the menstrual period.

(*c.*) AMENORRHŒA WITH ANÆMIA OR CHLOROSIS.

For a description of the constitutional symptoms and treatment of anæmia and chlorosis, see p. 258, *et seq.* Amenorrhœa is often the first symptom of anæmia and chlorosis; or it may make its appearance after these states have existed for a considerable period.

In addition to the general treatment of anæmia, it is sometimes necessary to prescribe the measures for the restoration of the menstrual discharge mentioned under the first variety of the disorder.

Amenorrhœa is sometimes accompanied by vicarious or supplemental discharges of blood, or of blood slightly altered from its usual character, from the nose, lungs, stomach, or rectum, and from ulcers of the skin. These discharges, if occurring in important organs of the economy, may require medical interference, and are best treated by leeching and purging, practised a little before they are expected.

The catamenia are normally absent during gestation and lactation. Some women, however, menstruate during pregnancy only. With others, the flow occurs at the regular periods during the process of lactation.

The *complications* of amenorrhœa, which are extremely numerous, must be treated by remedies appropriate to those complications, combined with such as restore strength to the system, and tend to reëstablish the menstrual discharge.

DYSMENORRHŒA—PAINFUL MENSTRUATION.

SYMPTOMS.—Pain in the loins preceding the menstrual period by a few hours or days; tenderness in the hypogastric region, and sometimes over a considerable extent of the abdomen; soreness or acute darting pains, resembling those of colic, and occurring mostly in paroxysms; vomiting; diarrhœa with tenesmus; dysuria. Hysteria is often present. These symptoms increase in severity until the appearance of the catamenia, and then cease suddenly or gradually. Severe cramp, with rigors and coldness of the surface, almost amounting to collapse, precede the flow in some cases. The discharge is often scanty, and is sometimes accompanied by a membranous formation moulded to the internal surface of the uterus.

CAUSES.—*Predisposing.* The rheumatic diathesis; the nervous temperament.—*Exciting.* Sudden and violent emotions; increased determination of blood to the uterus; sexual intercourse immediately before the expected flux; constipation; spinal irritation; exposure to cold; mechanical obstruction from organic or spasmodic constriction of the cervical canal, or from retroflexion of the uterus.

PROGNOSIS.—*Favourable.* Most cases admit of cure, or relief, by the improvement of the health, and proper local treatment.

TREATMENT.—I. When there is plethora, the application of leeches to the vulva, or cupping-glasses to the loins; tepid, hot, or vapour baths; opium alone, or with small doses of tartarized antimony frequently repeated.

II. Careful attention to the functions of the stomach and bowels, moderate depletion to meet any irregular determination of blood, and strict attention to the general health.

Organic impediments must be removed if possible. Stricture of the cervical canal may be relieved by graduated bougies carefully introduced. Those made of the fucus *Laminaria* are very serviceable.

MENORRHAGIA—EXCESSIVE MENSTRUATION.

The menstrual flux is excessive, when the intervals are less than three weeks, continues longer than six days, and is abundant during the whole of this time. It may be the effect of two opposite states of the system:—plethora (*active m.*); and general relaxation or debility (*passive m.*).

SYMPTOMS.—Menorrhagia, arising from plethora, is usually preceded by acute pains in the head and loins, a sense of heat, fulness and throbbing in the pelvis, turgid flushed countenance, universal heat, and a strong, hard pulse: when, on the contrary, the symptoms of debility prevail, the pulse is small and feeble, the face pallid; there is dull aching pain in the back and loins, and in nervous persons the group of nervous symptoms described under Mimosis Inquieta. (See p. 264.)

Causes.—*Predisposing.* Plethora; laxity of the womb from frequent parturition; displacement of the uterus; difficult and tedious labours, or repeated miscarriages; a sedentary and inactive life; heated apartments, and all causes of debility.—*Exciting.* Violent exercise; blows or concussions; violent straining at stool; tight lacing; sexual excess, particularly during menstruation; exposure to wet and cold; congestion or ulceration of the mucous membrane; uterine tumours. Attacks of menorrhagia are common in women at or shortly after the change of life.

Prognosis.—*Favourable*, if it be not of very long standing, or dependent upon organic disease.

Treatment.—The treatment of menorrhagia consists in—

1. Reducing the febrile symptoms and the plethoric condition of the pelvic circulation by free purgation, gr. x of colocynth and blue pill, followed by a saline (Form. 264) with ♏ xx tincture of henbane.

2. When the febrile symptoms are subdued, astringent remedies (Form. 167).

If the hæmorrhage be profuse, cold water should be injected into the rectum and vagina. If this does not suffice, injections of alum or tannic acid must be used, and, if need be, the vagina must be plugged with sponges saturated with such solutions.

The patient should keep the horizontal posture on a hard mattress. The clothing should be light and the regimen cooling.

3. When symptoms of debility are present, tonics or stimulants, in combination with sedatives, are required.

LEUCORRHŒA—THE WHITES.

Definition.—Discharge of a milk-white or glairy mucous fluid from the orifice of the vagina.

Varieties.—1. Vaginal. 2. Uterine.

1. VAGINAL LEUCORRHŒA—VAGINITIS.

Symptoms.—Pain and soreness, with heat and fulness of the vagina; vesical and urethral irritation, resulting in frequent micturition, pain, and dysuria; soreness and itching of the vulva; a thin colourless acid discharge becoming, in the chronic form of the disease, more or less creamy or purulent. The vagina is swollen and tender, and the mucous membrane, which is naturally of a pale rose tint, is uniformly dark red, and inflamed. This is an uncommon form of the disease.

DIAGNOSIS.—There are no characters by which simple vaginitis may be distinguished from the gonorrhœal variety. The character of the patient and of her husband, if she be married, must decide the diagnosis. Some observers are of opinion that simple leucorrhœa may, by contact, induce both urethral discharge and preputial sores in the male. From the uterine variety, it is distinguished by the absence of inflammation of, and discharge from, the os uteri, by the thinner and more acid nature of the discharge, and by the circumstance that vaginal leucorrhœa is not increased before or after the time of menstruation. There is also an absence of uterine symptoms, and the health suffers less.

CAUSES.—Simple vaginitis usually results from direct irritation: *e. g.* pessaries in the vagina; violence in sexual intercourse; irritation of the rectum from piles or ascarides. It is often associated with excessive acidity of the urine.

TREATMENT.—*General*, saline alkaline aperients, and the hip-bath.—*Local*, the removal of any sources of irritation which may be present; warm-water injections, and afterwards the injection of an astringent. (Form. 182, 189.)

In the chronic form the most scrupulous cleanliness is required. Zinc or alum injections should be used twice a day; quinine or the astringent chalybeates should be prescribed.

2. UTERINE LEUCORRHŒA—INFLAMMATION OF THE OS AND CERVIX UTERI.

SYMPTOMS.—The discharge of an inodorous white creamy fluid varying in quantity from a slight increase of the natural secretion to several ounces in the day, increased largely immediately before and after menstruation, and sometimes taking its place. Pain and weakness of the loins, excessive debility, and a sense of bearing-down in the pelvis; the vagina is relaxed, and the os uteri lower down than normal; the cervix uteri is swollen, and the os red, congested, patulous, and occupied by a glairy secretion like white of egg. As this passes down the vagina, it becomes altered by its acid secretion into a creamy fluid. The general health suffers in a marked degree: the appetite is lost or impaired; the bowels are constipated, or irritable; and spinal irritation are often present, and the symptoms described under Mimosis Inquieta (p. 264).

CAUSES.—Inflammation of the os and cervix uteri; the discharge is derived from the extensive glandular surface which Dr. Tyler Smith has shown to line the canal of the cervix uteri. Debility, suppressed menstruation, abortion, frequent parturition, lactation and congestion of the cervix uteri, all predispose to this condition.

TREATMENT.—I. Must be directed to improve the general health by the judicious use of saline aperients and tonics, moderate exercise, rest of the sexual organs, cold bathing, and, if need be, change of air. II. The local treatment will consist in the use of cold water or astringent injections (Form. 191). When much irritability is present, opiate injections may be required; and if there be much congestion, or if there be signs of local inflammation, a few leeches may be applied to the neck of the uterus.

The remedies which act on the mucous membrane through the general system are given in the Formulæ.

METRITIS—INFLAMMATION OF THE UNIMPREGNATED UTERUS.

1. ACUTE METRITIS.

Symptoms.—Pain, increased by pressure, in the region of the uterus, and in the cervix on examination per vaginam; pain extending to the loins and thighs; dysuria; a sense of weight and bearing down; swelling of the abdomen and tympanites. These local symptoms are generally accompanied by fever, with nausea and vomiting. In the most severe cases, there are slight delirium, drowsiness, extreme prostration of strength, diarrhœa, and subsultus tendinum. At first there is no vaginal discharge, but after a day or two, an abundant and often offensive purulent, or muco-purulent discharge, occasionally tinged with blood, appears. The uterus is slightly enlarged, and very tender to the touch, and the arteries of the cervix pulsate strongly.

Morbid Anatomy.—The substance of the uterus inflamed and enlarged, œdematous, and softened: in severe cases, pus is infiltrated through its tissue; or an abscess is formed in it. Purulent matter may also be found in the veins in the pelvic cellular tissue, and in the folds of the broad ligament. Swelling and redness of the mucous membrane.

Causes.—*Predisposing*. Those of inflammation generally.—*Exciting*. Suppression of the menstrual discharge from cold; the use of astringent injections; frequent sexual intercourse; extension of gonorrhœal inflammation; physical injuries; blows and falls; childbirth.

Treatment.—Leeches to the vulva or groins; a free saline aperient followed by calomel and opium (Form. 329), hot fomentations, turpentine stupes, or sinapisms, a hot hip-bath. Dysuria may be relieved by mucilaginous drinks, and the bowels should be kept free by gentle saline aperients, or by castor-oil.

2. CHRONIC METRITIS.

This is a common consequence of the acute form, when neglected or badly treated. It may assume a variety of shapes, and lead to a great number of severe structural lesions of the uterus, such as ulceration, suppuration, membranous inflammation, and enlargement and induration of the mucous follicles and muscular structure of the organ.

ULCERATION OF THE OS AND CERVIX UTERI.

1. SIMPLE ULCERATION.

SYMPTOMS.—Uterine leucorrhœa, occasionally tinged or streaked with blood; pricking, darting, or throbbing pain in the situation of the os uteri; great irritability of the bladder; a sense of bearing down. Action of the bowels, sitting, and sexual intercourse produce pain. It is also increased immediately before the appearance of the catamenia, and is usually absent for a short time afterwards. The menses are unusually profuse.

The os uteri is low down, swollen, and tender, and the hard and painful glandular tissue can be felt through the mucous covering. The cervix is enlarged, congested, and presents superficial ulceration on one or other side of the os, of variable extent. The ulcerations are depressed, and usually present healthy granulations. In chronic cases the granulations are angry-looking, and the edges of the ulcer thickened.

TREATMENT.—The *general* treatment will be the same as that for inflammation of the os and cervix uteri. (See Uterine Leucorrhœa.)

The *local* treatment consists in the use of mild zinc injections, and the repeated applications of nitrate of silver, solid, or as in Form. 182. When the cervix is within the patient's reach she may occasionally apply the Unguentum hydrargyri nitratis.

2. CORRODING ULCERATION.

SYMPTOMS.—Pain and weakness in the loins; more or less localized pelvic pain and uneasiness, sometimes of an acute burning or cutting nature; the passage of hardened fæces gives pain; at first there is leucorrhœa, subsequently a thin watery yellowish discharge, occasionally tinged with blood; as the ulceration spreads, attacks of profuse hæmorrhage, which sometimes recur so often as to endanger the life of the patient. The finger detects a loss of substance; the cervix is shorter or altogether absorbed, but the eroded surface is soft and rarely very uneven; there is no induration about the edges or base of the ulcer, the whole surface of which has a pulpy feel. Pressure with the tip of the finger does not produce pain, but merely a sensation of soreness. The ulcer has a ragged excavated appearance, and is covered with ashy-grey débris; when this is removed a raw bleeding surface is exposed. In severe cases the ulceration extends to the contiguous parts of the vagina. The fundus of the uterus is unaffected, and easily moved.

The patient becomes anæmic and excessively debilitated from the repeated hæmorrhage due to the erosion of blood-vessels in the extension of the disease; and if the disease be not speedily checked she dies of asthenia.

DIAGNOSIS.—From cancerous ulceration by the absence of induration, of acute pain on pressure, and of paroxysms of darting pelvic pain, by the *mobility* of the uterus and the limitation of the disease.

PROGNOSIS.—*Unfavourable.* But if we can treat the disease early, we may arrest, and in some cases cure it.

TREATMENT.—Must be directed to improve the health by astringent tonics and nutritious food. To check the erosion by the application of strong nitric acid, the acid nitrate of mercury, nitrate of silver, and the actual cautery. The most efficacious is the actual cautery. When the eschar separates the caustic should be again applied if the surface does not present a granular appearance. When healthy granulations appear, we may expect a permanent cure. The vagina should be frequently injected with astringent lotions.

CANCER OF THE UTERUS.

SPECIES.—1. Medullary. 2. Epithelioma (cauliflower excrescence).

MEDULLARY CANCER.

SYMPTOMS.—Deep-seated pains in the pelvis coming on in paroxysms and readily induced by evacuation of the bowels or bladder, the recurrence of the menstrual period, or sexual intercourse. The paroxysms gradually lengthen, the pain assumes a sharp neuralgic or lancinating character, and the menstruation becomes irregular. Menorrhagia is an early and prominent symptom. There is a sense of weight and fulness in the pelvis. The cervix is enlarged and hard, the os uteri patulous, and its margins hard and deeply notched; pressure produces acute pain; the body of the uterus is enlarged, and has lost much of its mobility. The os and cervix appear swollen, tense, and of a mottled red, or purplish colour; in many cases the mucous membrane retains its natural appearance. The indurated tissue soon begins to ulcerate and break down, and a watery, greenish, very fœtid discharge, occasionally tinged with blood, appears; and hæmorrhage now very frequently recurs. The enlarged cervix becomes soft and ragged, and the finger may be readily passed into the uterus, the walls of which feel partly pulpy and partly nodular. The fundus is now firmly fixed in a solid mass which surrounds it. The degeneration and ulceration slowly extend backwards, involving the rectum; or forwards, implicating the bladder. The walls of both of these cavities are sometimes destroyed, and the contents mingle in the vagina with the uterine discharges, and are in part evacuated through the vulva. The health rapidly declines, the stomach sympathises and food is rejected, the cachexia and emaciation are extreme, and the patient dies, worn out by the excruciating pain and excessive discharges.

DIAGNOSIS.—Hæmorrhage, and in the intervals a watery fœtid discharge; deep-seated paroxysms of lancinating pain; indurated enlargement of the os and cervix uteri; *immobility* of the fundus; emaciation and a sallow cachectic appearance are positive indications of the cancerous nature of the disease.

TREATMENT.—In the early stage when the deposit is limited to the vaginal portion of the cervix, the removal of this portion by means of the écraseur. Later on the treatment must be palliative only—the application of caustics does harm. The general treatment will consist in the exhibition of chalybeate tonics, of iodide and bromide of potassium, combined with tonic infusions. The pain and irritability of the stomach may be relieved by alkalies in a state of effervescence, combined with hydrocyanic acid. When the stomach will bear it, cod-liver oil may be given to counteract the emaciation. The strength should be sustained by wine and light nutritious diet administered frequently, in small quantities. Sleep must be procured, and the uterine pain alleviated by occasional doses of opium. Opiate suppositories and injections may be employed with the same view. The vagina must be frequently washed out with warm water, to which a little carbolic acid has been added, to destroy the fœtor of the discharges. When disease opens the rectum or bladder, the most scrupulous attention to cleanliness will be required.

2. EPITHELIOMA (CAULIFLOWER EXCRESCENCE).

SYMPTOMS.—A copious watery discharge, occasionally streaked with blood, from the vagina; subsequently profuse florid hæmorrhage, induced by sexual intercourse, straining at stool, or any other direct cause of congestion or irritation; a rough villous insensible mass is felt attached to the os uteri at some part of its circumference; the tumour has a florid colour, and a granular or villous structure; when handled freely, it bleeds. Its growth is rapid, and it sometimes attains such a size as to occupy the whole of the vagina and protrude between the labia. The disease is limited to the uterus, and if removed it is speedily reproduced. The patient rapidly becomes anæmic, and dies of asthenia.

DIAGNOSIS.—The structure and appearance of the tumour and its origin by a broad base from the os uteri are conclusive as to its nature.

TREATMENT.—The *general* treatment will consist in the exhibition of the astringent chalybeates combined with the mineral acids; the only efficient *local* treatment is removal of the tumour and contiguous part of the cervix uteri by means of the écraseur, and the subsequent use of strong nitric acid, or the actual cautery, followed by astringent injections.

FIBROUS TUMOURS OF THE UTERUS.

These occur, I. As interstitial growths within the muscular walls of the uterus. II. As isolated fibrous or fibro-cartilaginous masses developed within the uterine walls, and projecting more or less from them. III. As pedunculated growths attached to the outer, or more frequently, to the inner surface of the uterus (*Uterine polypi*).

The *first and second variety* often form enormous growths from the uterus, sometimes weighing more than fifty pounds, and are accompanied by hypertrophy of its natural structure, with enlargement of its cavity. They are composed of white fibrous or of fibro-cartilaginous tissue, and have very little vascularity. They are of gristly, and occasionally, from more or less perfect ossification, of bony hardness. Their colour is greyish-white, and the section is pervaded by intersecting or concentric bands of white fibrous tissue. The first variety of tumour is continuous with the uterine tissue; the second, which is almost always composed of fibro-cartilage, is surrounded by a distinct areolar investment, which, by limiting it, allows of its ready separation from the contiguous uterine tissue. Usually there are more than one of these tumours. In projecting outwards towards the peritoneal cavity, or inwards towards the mucous surface, they sometimes become almost completely invested, in the former case with peritoneum, in the latter with mucous membrane, and so come to form large pedunculated growths. Cysts are occasionally formed in the interior of these tumours.

The symptoms which attend the development of the first and second variety are precisely similar. They are usually so obscure, that the tumour attains a considerable size before it attracts attention, and then the patient supposes she is pregnant, or the subject of dropsy. When the rectum or bladder are pressed upon, there will be frequent desire to evacuate the fæces and urine, and more or less difficulty will probably attend these acts. The menstrual function is sometimes interfered with, sometimes not. In the majority of cases the discharge is more profuse than usual, and it is apt to come on at irregular intervals; occasionally there is dysmenorrhœa. The os and cervix uteri are felt to be natural; but around and above the latter there is a hard rounded mass, filling up the sacral cavity. If the other hand be placed upon the lower part of the abdomen, a large hard nodular mass may be tilted against it by pressing the tumour upwards with the finger. The uterine sound readily passes, sometimes in one direction, sometimes in another, an unusual distance within the uterine cavity, proving that it has undergone considerable enlargement.

The health is unaffected so long as the pressure of the tumour does not produce derangement of the contiguous viscera or blood-vessels.

Treatment.—The treatment of the first variety must be purely constitutional. With a view of reducing the tumour and preventing its further development, chloride of calcium, iodide or bromide of potassium, and the Kreuznach waters have been recommended.

Enucleation has been proposed for the second variety; but the operation has been attended with so large a proportion of deaths that we deem it unjustifiable. When self-enucleation of the tumour has been nearly effected, we may facilitate its expulsion from the uterine cavity by dilating the os and cervix and administering ergot.

The *third variety* of fibrous tumours (*uterine polypi*) give rise to much more serious *symptoms*. These are leucorrhœa and hæmorrhage, which increase in severity and endanger the patient's life. At first the menstrual periods are protracted, then the discharge becomes more profuse. In the intervals there is profuse leucorrhœa. After a time the regularity of the hæmorrhage ceases, and the patient is at last rarely free from sanguineous discharge, and a constant bearing-down or dragging sensation. On examination, the os uteri is felt low down, and patulous, and on passing the finger within the orifice a firm rounded projection may be felt, which can only be mistaken for the inverted fundus. The *diagnosis* is readily effected by means of the uterine sound, which, in the case of the pedunculated tumour, proves that the cavity is enlarged, while in inversion of the fundus it is diminished. If the cervical canal be contracted it must be dilated with a sponge tent in order to ascertain the existence of a tumour.

Treatment.—The only efficient treatment consists in the removal of the tumour. The os uteri having been dilated, the tumour must be seized with a hooked forceps and pulled downwards, and a ligature passed round the pedicle. Whenever it is practicable, the pedicle should be severed by the ecraseur, or blunt scissors; for the putrefactive process which follows ligature without subsequent removal of the tumour, is very liable to set up putrid fever and endanger the patient's life.

PELVIC HÆMATOCELE.

SYNONYMS.—Uterine, peri-uterine, and retro-uterine hæmatocele.

Attention has of late years been called to the fact that during the intense vascular excitement which occurs at the menstrual periods, the congested vessels of the ovary or fibriated extremity of the Fallopian tube may rupture and lead to effusions of considerable quantities of blood into the recto-uterine pouch. This accident of menstruation is most frequent between the ages of twenty and thirty, the period of greatest sexual vigour.

SYMPTOMS.—Usually after sudden suppression of the menstrual discharge, severe abdominal pain, undergoing increase at intervals, tenderness of the lower parts of the abdomen, difficulty and pain in micturition and defæcation; usually pain in flexing one or other thigh; there is increased fulness of the abdomen. The pelvic tumour differs much in size and situation. It usually bulges the posterior wall of the vagina, and tilts the body of the uterus forwards. It feels hard and solid. If all go on well, the pain and fever subside, and the blood begins to be absorbed. During the process, which is a slow one, there remains some difficulty in evacuating the contents of the bladder and rectum; there is weight and bearing down in the pelvis, and walking causes pain or inconvenience. The effused blood sometimes sets up pelvic inflammation, and the clot, becoming imperfectly encysted, breaks down into pus. The abscess may burst into the vagina, the rectum, bladder, intestine, or into the peritoneal cavity.

TREATMENT.—At the time the hæmorrhage occurs, we may, in a plethoric person, take fifteen or twenty ounces of blood from the arm.

In other cases half a dozen leeches should be applied around the anus. A full dose of opium should be given, and subsequently Form. 213, with a little sulphate of magnesia.

The absorption of the blood tumour may be facilitated by iodine infrictions, and the internal administration of iodide of iron. The menstrual function should be regulated, and the circulation relieved, before each catamenial period by the administration of brisk hydragogue purgatives.

DISPLACEMENTS OF THE UTERUS.

The unimpregnated uterus is liable to downward, backward, and forward displacements, known respectively as *prolapsus*, *retroversion*, and *anteversion.*

PROLAPSUS, may be *partial;* or *complete*, when the womb protrudes entirely out of the vagina.

Symptoms.—A sense of bearing down; dragging pain in the loins; leucorrhœa. If the uterus be displaced suddenly, acute pain; fainting, and hæmorrhage.

Diagnosis.—From protruded pedunculated tumour, by the arrest of the uterine sound when passed aside of the tumour into the vagina. The finger or sound cannot be introduced beyond the prolapsed uterus, because the vagina is pushed down with it and inverted. The prolapsed uterus forms a pear-shaped tumour, the small end being directed downwards and presenting the orifice of the cervix. These characters distinguish it from the inverted uterus.

Causes.—Leaving bed too soon after parturition; debility and leucorrhœa; severe chronic cough; straining; injuries to the perineum.

Treatment.—Tonics, astringent injections, and sponge pessaries, are usually sufficient for the relief of partial prolapse. A T bandage and suitable pessaries are needed in addition, when the prolapse is complete.

RETROVERSION.—I. When the womb is completely displaced, the fundus is directed backwards against the rectum, and the os forwards towards the symphisis, and the organ lies horizontally across the pelvis. II. The position of the os and cervix may not be greatly altered, while the fundus is bent downwards and backwards at the upper part of the cervix, so as to descend as low as the os and lie in the recto-uterine pouch: this condition is known as retro*flexion.*

Symptoms.—Sacral pain, aggravated at the menstrual periods, sense of dragging in the groins and down the inside of the thighs, irritability of the bladder; dysmenorrhœa; menorrhagia. The os uteri is swollen, congested, low down, and directed more or less forwards; behind it a firm round tumour can be felt through the posterior wall of the vagina, filling up the hollow of the sacrum and pressing on the rectum. On tracing the cervix upwards from the posterior lip, the finger comes upon the angle formed by the body and neck of the uterus. The uterine sound passes but a short way if its curve be directed forwards, but on rotating the handle, the instrument readily passes into the uterine cavity, and its point can be felt, by the finger in the rectum, occupying the interior of the retroflexed fundus.

Causes.—Predisposing. Abortion, constipation, retention of urine, laxity of the uterus, and of the round and broad ligaments.—*Exciting.* Straining; a false step.

Treatment.—Replacement with the uterine sound, after which the patient should lie in the prone position for some hours, and do so daily for a time; astringent injections; the bowels to be kept free; all straining to be avoided.

ANTEVERSION is the rarest displacement of the uterus.

Symptoms.—Pubic pain; pain and irritability of the bladder; the os uteri directed more or less backwards, and the fundus felt through the anterior wall of the vagina just behind the symphisis. When the os uteri is not directed much backwards, there is dysmenorrhœa from obstruction caused by the bending of the cervix. The uterine sound only passes when the point is much curved forwards.

Causes.—Predisposing. Abortion, constipation.—*Exciting.* Violent exertion; sudden jolting, as in riding.

Treatment.—Replacement with the uterine sound; the supine posture; purgatives; an abdominal belt.

OOPHORITIS—INFLAMMATION OF THE OVARY.

SYMPTOMS.—A dull, sickening, deep-seated pain in the groin, with tenderness of the iliac region. So long as the inflammation is confined to the ovary the pain is local, but frequently it involves the contiguous peritoneum, and becomes diffused over the lower part of the abdomen, which is swollen and tender; the pain increases in severity, and radiates down the inside of the thigh, being increased by extension of the leg; nausea and vomiting come on, and the symptoms much resemble simple peritonitis; but on manipulation we have no difficulty in tracing the pain to its source deep in one or other of the iliac fossæ. The os and cervix uteri are usually very painful to the touch, not from inflammation of these parts, but from transmission of the pressure to the inflamed ovary. On passing the finger alongside of the cervix, the exquisitely tender ovary may be felt through the wall of the vagina, lying in the direction of the sacro-iliac articulation. Whether we feel the ovary or not, pressure in this direction causes intolerable sickening pain.

CAUSE.—Suppression of the menses, from exposure to cold.

TREATMENT.—A full dose of opium; leeches, applied to the groins, anus, or, still better, to the upper part of the vagina on the painful side; a hot hip-bath and a brisk purgative; hot fomentations to the abdomen. If there be signs of peritoneal inflammation, calomel and opium must be administered, so as slightly to affect the gums. If the menstrual flow can be re-established, the patient will probably do well. If the acute inflammation be neglected or improperly treated, the disease becomes chronic, and ovarian dysmenorrhœa, or cystic disease of the ovaries, will result.

OVARIAN TUMOURS AND DROPSY.

Ovarian tumours are almost invariably cystic growths.

From the nature of the changes which attend the development and discharge of the ovum, no other organ is so liable to cystic degeneration as the ovary. Indeed all the elements of such a morbid process are present at every menstrual period. Hence the necessity of carefully regulating this important function.

The following varieties of ovarian tumour are found to occur:—

1. *The simple cystic tumour.*—The ovary being distended into a single cyst containing several gallons of fluid, which is usually a clear watery serum, but, in some cases, a thick brown grumous fluid, which, when heated, becomes solid.

2. *Compound ovarian cysts.*—In these the proportion of solid and fluid constituents varies; sometimes the cysts are very large, and separated by thin partitions; sometimes small, and surrounded by thick walls of firm fibrous or vascular tissue. This latter kind has been named *Cystosarcoma.*

3. *Alveolar or colloid tumour.*—In this form the enlarged ovary is developed into innumerable minute cells, none exceeding an inch in diameter, filled with a glutinous jelly-like material.

4. *Cysts containing developed tegumentary organs*—teeth and hair.

Symptoms.—Are at first obscure, and attract little or no notice; suppression or irregularity of the menses, is one of the earliest symptoms; pain, referred to the side where the disease begins, is present in one-third of the cases; retention of urine, or difficult micturition, in about one-ninth; in one-third of the cases the tumour is discovered unexpectedly. (West.) It is always at first seated on one side. When it has attained such a size as to attract the patient's notice, there is pain or numbness extending down the corresponding leg, and when the left ovary is affected the passage of fæces may be hindered. Usually there is more or less complete suppression of the catamenia.

As the tumour grows it distends the abdomen equally, and may then be mistaken (if mostly solid) for the pregnant uterus, a fibrous tumour of that organ, or cystic disease of the kidney (see p. 549); if it be fluctuant, for ascites.

OVARIAN DROPSY.

The first two varieties of ovarian tumour (the monocystic and the polycystic) are those that give rise to ovarian dropsy. A distinction can generally be made by the extent of the fluctuation. In the case of the single cyst, a tap on one side of the belly produces distinct fluctuation on the other. When the cyst is compound, the partitions interrupt the fluctuation generated in any one cyst, and it can be only felt within its own limits. In either variety the most protuberant parts of the abdomen are dull on percussion, while the sides are more or less resonant. The belly does not swag to the sides when the patient lies in this position; the upward development of the tumour causes great divergence of the false ribs, and if the fingers be insinuated between their margin and the tumour, its tense rounded outline may be felt.

DIAGNOSIS OF OVARIAN DROPSY.—From the *pregnant uterus*, by the absence of fœtal sounds and movements, by the unaltered state of the uterus. From *ascites*, by the history of the case, which shows that the tumour commenced in the side; the tumid abdomen sways from side to side according to the position of the patient; and that its most prominent parts are resonant from air in the floating intestines. In ascites the pelvic viscera are pushed down, and the uterus is low: in ovarian disease, the tumour rises out of the pelvis, and drags the uterus a little way with it. Some cause of ascites, such as an enlarged nodular liver, may also be discovered.

The *distended bladder* has been mistaken for ovarian dropsy. As it forms a symmetrical pyriform tumour, this can only occur through gross carelessness; but there is some excuse for mistaking for it an assymetrical multilocular bladder. I have myself seen half a pint of urine drawn, by the trocar and canula, through the abdominal walls, from a distended bladder of this description.

TREATMENT.—If the tumour come under treatment early, increases, and is moveable, it should be extirpated forthwith. From the results of the operation of spaying in quadrupeds we infer how safely the removal may be effected in the early stages of the disease. When the tumour has attained a great size, removal should not be attempted if, from manipulation and the history of previous attacks of pain and pyrexia, we infer that the tumour is adherent. In such cases, if the tumour be fluid we must resort to tapping as often as the pressure of the tumour interferes with the respiratory or digestive functions. Excision of a portion of the cyst wall, and the injection of solutions of iodine, have been successfully employed to procure inflammatory adhesion of the cyst walls and obliteration of the cyst in those cases in which the tumour cannot safely be removed.

With a view of arresting the growth of the tumour we must seek to improve the health of the patient by astringent tonics.

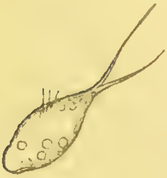
GONORRHŒA.

DEFINITION.—A specific inflammation of the genito-urinary mucous membrane from impure sexual connection.

SYMPTOMS.—In men, about seven days after contagion, a tickling sensation at the orifice of the urethra and scalding pain along the passage in micturition; the orifice is red and swollen, and in the course of a few hours a thin discharge, quickly becoming thick, puriform, and of a yellowish-white colour, appears. The passage becomes much swollen, and the stream of urine is diminished. Painful erections occur, and occasionally a little bleeding takes place after micturition. The prepuce is usually much inflamed and swollen, giving rise to phymosis or paraphymosis. If the body of the penis be implicated in the swelling, painful curving of the organ (chordee) takes place during erection. In severe cases the inflammation extends backwards, to the seminal ducts, and thence along the vas deferens to the testicle; to the bladder; or to the uterus, producing severe inflammation of these parts. When orchitis supervenes the puriform secretion is altogether suppressed. If suppression occur, febrile symptoms set in, and severe ophthalmia or swelling of the joints (gonorrhœal rheumatism) appears.

In women the inflammation is usually confined to the vagina, and unless the urethra is implicated little pain or inconvenience is experienced. When it extends to the uterus, symptoms of severe metritis (p. 568) appear.

Fig. 78.



Diagnosis.—From simple urethritis and vaginal leucorrhœa, by the violence of the inflammation. Donné considers the presence of the ciliated animalcule the Trichomonas vaginalis, (Fig. 78), to be diagnostic of the specific vaginal inflammation; but it is formed with other morbid conditions of the vaginal mucus.

Treatment.—In mild cases the administration of saline purgatives; and injections of warm water followed by a mild lead or zinc injection. If the discharge do not cease after the pain and inflammatory symptoms have disappeared, copaiba or cubebs are required.

If there be much swelling and chordee, hot fomentations and the use of lint soaked in the Linimentum belladonnæ; to prevent the latter condition, a grain of opium with camphor may be given.

In many cases the discharge degenerates into a colourless glairy secretion known as *gleet*. This is very difficult to remove: it appears to be caused by a congested and relaxed condition of the mucous membrane of the urethra. In such cases cubebs, copaiba, and cantharides are often efficacious.

SYPHILIS.

Definition.—A specific disease, arising from contact with a peculiar animal poison.

Symptoms.—After a period of incubation, varying from three to five days, the appearance of a pimple, pustule, crack, or abrasion upon the skin or mucous membrane of the genital organs. In the male the glans or the under surface of the prepuce, and in the female the inner surface of the labia, are the parts usually affected. The pimple enlarges, and the base becomes red; usually the summit softens down into a thin purulent fluid; the cuticle gives way, and a minute excavated sore, destitute of granulations, is formed. The sore now enlarges, and in two or three days attains the dimension of a pea; it is perfectly circular, and deeply and smoothly concave, being covered with a smooth ashy layer of sloughy tissue. The ulcer is limited by a smooth, round, narrow, red ring, barely or not at all elevated above the surrounding surface. As the ulcer grows, the red edge becomes broader and elevated, and the surrounding tissue is indurated; minute raw or pale granulations, partly covered with ashy débris, spring from the bottom of the ulcer and yield a little ichorous, watery, or thin purulent discharge. The induration and elevation increase, and a well-marked indurated or "Hunterian" chancre is thus formed. Cracks and abrasions, if left to themselves, tend to the same condition. In some cases the pimple never becomes pustular, but undergoing enlargement and induration, passes into a characteristic red tubercle.

After a variable interval, secondary symptoms occur, indicating that the virus has been absorbed. The earliest and most constant of these is bubo. One or more glands in the groin become enlarged, tender, and very hard. At first they are not inflamed, their surface is smooth, and they readily move under the finger. They may remain in this condition for months; but usually inflammation, acute or chronic, supervenes. The gland enlarges, and, the surrounding areolar tissue being implicated, it loses its distinctness and mobility. If the inflammation be acute, the integument becomes tense and red, and sooner or later fluctuation may be felt.

Among the earliest and most common of the secondary symptoms, is ulceration of the membrane of the soft palate and mouth. The ulcers are usually superficial, and appear as mere abrasions surrounded by slightly elevated rounded smooth margins, about which the epithelium has an opaque appearance. They occur on the inner surfaces of the lips, at the angles of the mouth, on the sides of the tongue, but chiefly on the arches of the soft palate and surfaces of the tonsils. In this last situation they are apt to become excavated and ragged. Frequently the mucous membrane and submucous tissue of the larynx is similarly affected, and the voice becomes gruff and husky.

This condition of the mucous membrane is almost always associated with one or more of the following forms of cutaneous disease.

Syphilitic roseola.—After slight constitutional disorder, with headache, and frequently tenderness of the scalp, the trunk, limbs, and face become mottled with light mulberry-coloured blotches, not elevated, and disappearing on pressure. The epidermis is unaffected, and the spots are distinct, and fade off into an indistinctly circular circumference. This rash is slow in disappearing. It is, I believe, the first stage of the leprous affection. Its appearance is usually followed by rapid shedding of the hair, leaving the scalp almost bald.

S. impetigo.—The favourite seat of this eruption is the scalp. It is preceded by pain and tenderness, and commences as distinct red circular spots, which become slightly raised; a muco-purulent exudation next takes place beneath the epidermis, and the spots are subsequently covered with greenish scales. If these be removed, a little depressed, irritable sore is exposed, on which the scab reforms again and again. Ultimately they heal and leave minute scars. The eruption often appears on the face and other parts of the body.—*S. ecthyma and rupia* are but increased developments of this form in debilitated constitutions.

S. lepra appears first as roseola. The injected derma subsequently becomes thickened and elevated into a round copper-coloured "*S. tubercle*," or, if less elevated, a slight tumid base, on which the epidermal cells become dry and silvery, constituting *S. lepra and psoriasis.*

S. lichen.—Small, hard, conical, copper-coloured elevations, formed of the hypertrophied papillæ of the skin, appearing over all parts of the body, and being often intensely irritable. Usually they remain dry and covered with scaly epidermis, but in persons of enfeebled constitution they suppurate, and may then be described as

S. varioloid eruption.—The lichenous rash may have existed for weeks, or have preceded the pustular eruption but a short time. The papules exhibit first a little milky serum; but in about a week they are converted into pointed, thick-set but discrete pustules, resting on an inflamed, slightly raised, bright rose or copper-coloured base. They appear earliest, and in greatest numbers, on the face; later and more thinly scattered on the trunk. A fortnight or three weeks may elapse before the whole of the pustules on the body maturate. The subsequent history of the pustule is much the same as that of variola; but the processes of squamation, desquamation, and absorption of the inflammatory products around the bases occupy a much longer time. Minute cicatrices, stained for a long time with a dusky brown colour, remain. When the eruption is extensive and well-marked, the patient presents the appearance of one covered with small-pox; but on closer examination, the small size of the pustules offer a ready distinction.

Such is the relationship which careful observation leads me to establish between the principal syphilitic skin diseases.

But the skin and mucous membranes are not the only structures affected by the syphilitic virus. The serous and fibrous tissues may be involved. The iris, retina, dura mater, and periosteum are all, at a later period, liable to be affected. The resulting iritis, retinitis, epileptic convulsions, and periostitis, are usually classed as tertiary symptoms. The periostitis, if chronic, results in severe neuralgic pains, and nodes; if acute, it ends in necrosis. The same poison induces similar morbid processes in the viscera. (See Diseases of the Liver.)

If personal cleanliness be neglected, and the discharges from the primary sores be allowed to excoriate the contiguous parts, condylomatous growths result. It is not uncommon in young females, ignorant at first of the nature of the disease, and when informed, ashamed to apply for advice, to find the vulva, perineum, and margin of the anus covered with condylomatous growths, and the labia and clitoris themselves converted into large mis-shapen pendulous masses, exsuding an offensive ichorous fluid. Warts, and probably elephantiasis, have the same origin.

PATHOLOGY.—The syphilitic poison, when introduced into the blood, causes a low sluggish form of adhesive inflammation, accompanied by the effusion of solid unorganized matter. Unlike the solid products of common inflammation, this material seems little susceptible of absorption or of conversion into fibrous tissue. Like tubercular matter, its tendency is to break down and produce unhealthy ulceration.

CONTAGION.—A person may become infected with syphilis in three ways:—1. By *absorption*. 2. By *inoculation of the discharge* from a chancre. 3. By *inoculation of the blood* of a person in whom secondary symptoms are present. The disease is commonly propagated by the first mode, the poison being absorbed during sexual intercourse through the delicate cuticle into the capillaries of the mucous membrane; and more readily if the cuticle be abraded.

With regard to inoculation, M. Ricord has shown that if a little secretion from a chancre be taken on the point of a lancet and introduced into any part of the skin of a person *free from constitutional syphilis*, a similar infecting chancre is produced there. The following is a description of its development. During the first twenty-four hours a little redness round the puncture; from the second to the third day a papular elevation seated on an inflamed areola or base; during the fourth day a vesicle due to the effusion of turbid fluid beneath the cuticle covering the papule; throughout the fifth day the effusion increases and becomes more or less purulent; the centre of the pustule is depressed, and the areola redder and swollen; during the sixth day the tissue surrounding the base of the pustule hardens and feels elastic like fibro-cartilage. Subsequently the swelling, induration, and effusion increase, the cuticle gives way, a scab forms, and when this is detached the indurated chancre above described presents itself. If, however, the syphilitic virus have been previously absorbed into, *and be actually present* in the blood of an individual, inoculation of matter from an infecting sore on his own person, or on that of another, produces no effect. This non-production of a chancre around the point of inoculation is accepted as proof that the syphilitic poison already pervades the constitution. It would appear that the constitution is infected on or about the fifth or sixth day of the development of a primary chancre, that is, at the time, when the specific induration appears. If, then, the individual be inoculated before the fifth day with syphilitic matter from his own developing chancre, or from any other source, an infecting chancre will be produced around the point.

As to the third mode of propagation, it has been satisfactorily shown that inoculation with the blood of a person affected with secondary syphilis will produce an infecting chancre. The disease has been transmitted in this manner by vaccination, the blood of a child suffering from secondary syphilis having mingled with the vaccine matter derived from it, imperfectly developed vaccine vesicles have resulted, and passed into the condition of indurated chancres—a result the more remarkable since the infecting child itself never had the primary disease.

Hereditary transmission of Syphilis.—Just as the *fœtus in utero* participates in small-pox affecting the mother, so may it be with syphilis. Hundreds of sickly infants attest this painful fact. Several good observers consider it to be a well-established fact that the infection of the infant may take place independently of the existence of a chancre or syphilitic bubo in the mother during gestation.

ORIGIN.—Some authors are of opinion that syphilis had its origin in some very remote age, and that it has been transmitted by successive contact with infected persons to the present generation. When it has been proved that certain conditions, or combinations of circumstances, happened in remote ages, which are never repeated now, we may accept this hypothesis. At present it is more philosophical, and more in accordance with what we know of the origin of other contagious diseases, to assume that the virus is every day generated anew.

DIAGNOSIS.—The primary sore may be known by the ashy excavation or pale warty granulations of the surface, and by the elevated, rounded, circumscribed induration which borders and surrounds it.

TREATMENT.—1. *Local.* Before the end of the fifth day the primary sore admits of arrest and cure by the application of nitrate of silver, strong nitric acid, or caustic potash. When the slough has separated, the ulcer may be dressed with black wash or calomel ointment. If the disease come under notice after induration, local treatment will be of no service. The sore must be kept clean and free from irritation, and constitutional treatment must be adopted.

II. *Constitutional.*—This consists in the exhibition of mercury in the form of calomel or pilula hydrargyri in small and repeated doses, combined, if bubo be present, with the infriction of mercurial ointment into the groins until the gums become red, slightly swollen, and tender. No disease has a remedy more efficacious than syphilis has in mercury, and if the patient be carefully watched even stomatitis need not result from its use. Under its influence, the hard effused products melt away, the bubo disappears, the ulcer assumes a healthy aspect and heals. When the constitutional effects of mercury have been thus induced, they should be kept up for a time by the occasional use of a little mercurial ointment.

When it is desirable to affect the system speedily, gr. xv to gr. xxx of calomel should be sublimed and retained in contact with the person by means of a blanket.

If the primary disease have been treated by mercury, secondary and tertiary symptoms, such as the cutaneous and periosteal affections and ulceration of the larynx, very readily yield to iodide of potassium, given in doses of from gr. iii to gr. x thrice a day. If mercury have not been used in the treatment of the primary disease, it must be given in combination with iodine. Gr. i to gr. iii hydrargyri iodidi viridis, or gr. $\frac{1}{16}$ to gr. $\frac{1}{14}$ hydrargyri iodidi rubri may be given in the form of pills thrice a day; or the latter may be combined with an excess of iodide of potassium, in solution of which it is soluble, and thus given in the form of mixture.

Two other forms of syphilis remain to be described, viz. Infantile Syphilis and Local Syphilis.

INFANTILE SYPHILIS.—The child may be born apparently healthy. The first symptom which usually appears is inflammation of the nasal passages, resulting in a muco-purulent discharge, causing obstructed nasal breathing. This is popularly known as the *snuffles*, and the child is supposed to have a cold. It now becomes pallid and fretful, and rapidly emaciates. After about a fortnight an eruption of copper-coloured blotches appears around the anus, the adjacent parts of the buttocks, and on the lower extremities. After a time it appears on other parts, particularly about the folds of the neck and joints. The eruption consists of circular spots slightly raised and subsequently covered with thin dryish cuticle (S. lepra), and on the folds of the groin, and about the perineum it is apt to become moist and excoriated, in which condition condylomata are liable to form. As the disease progresses, the intervening skin usually becomes copper-coloured, superficial ulcers appear on the inside of the mouth, the infant presents an extremely cachectic and emaciated appearance, and, if the specific remedy be not applied, soon dies of asthenia.

Treatment.—Gr. i to gr. ii hydrargyri cum cretâ twice or thrice a day, continued until the snuffles and rash have disappeared, and for two or three weeks afterwards.

LOCAL SYPHILIS.—Mr. Henry Lee recognises four forms of primary syphilis: viz. 1st, The indurated chancre. 2nd, The suppurating sore. 3rd, Ulcerative syphilitic inflammation. 4th, Destructive syphilitic inflammation.

The first form is that which has been already described as producing constitutional syphilis. The other three forms of the disease are, according to Mr. Lee, purely local, and, as such, never give rise to secondary symptoms, or require specific constitutional treatment. The secretion of each of these three forms may be artificially inoculated.

SPERMATORRHŒA.

SYMPTOMS.—Involuntary seminal discharges, occurring either during sleep, or in the day-time, and, in extreme cases, on the slightest friction or irritation of the genital organs. The constitutional symptoms are out of proportion to the loss of fluid sustained, and are due in part to the intimate relation subsisting between the sexual function and nervous system. They are those of Mimosis Inquieta (p. 264), and Hypochondriasis (p. 418). The patient is restless, listless, timid, and desponding. He is subject to flushings of the face, headache, giddiness, noises in the ears, disordered vision, dilated pupil, and other symptoms of cerebral congestion, to palpitation and shortness of breath. He is easily startled by noises and readily irritated, and has various nervous feelings, as of cold water trickling down the back, or of ants crawling over the skin; or weakness and numbness of the hands. His memory fails, and his intellect grows weak; he hesitates, and often stammers in his speech. In the most severe cases, the patient's mind is still more seriously affected. His spirits are depressed; he is addicted to silence and solitude; is timid and morose; believes himself to be the object of plots and persecutions; grows weary of life, and is tempted to commit suicide; and, at length, becomes the confirmed victim of monomania or dementia. Among the occasional symptoms and consequences of this affection are impotence, rigid contraction of the limbs, paralysis agitans, epilepsy, strabismus, amaurosis, bulimia, and nervous asthma.

CAUSES.—Sexual excesses; masturbation, pruritus scroti, ascarides, hæmorrhoids, fissures of the anus, and stricture of the rectum; blisters, and cantharides taken internally; sleeping on the face.

DIAGNOSIS.—The fluid is identified as coming from the vesiculæ seminales by the physical and microscopic characters of the semen (see Fig. 28, p. 135). In one case which came under my notice, the patient mistook an abundant pale sediment of urate of ammonia (Fig. 17, p. 129), completely dissolved by heat, for semen. (G.) The urine alleged to contain semen should always be submitted to examination.

PROGNOSIS.—*Favourable* in those cases in which the discharge is nocturnal, and always preceded and accompanied by the usual sexual phenomena. Less favourable in those cases in which the discharge is diurnal, and produced by slight causes affecting the state of the genital organs. Most favourable when traceable to mechanical causes in the rectum, urethra, or scrotum.

TREATMENT.—The patient often requires comfort more than medicine. As a general rule, cases in which the emissions are nocturnal, and accompanied by the usual sexual phenomena, admit of cure by abstinence from any bad habits which may have caused them.

The treatment by medicine will consist in all cases of aperients regularly administered, to secure an open state of the bowels (aloetic aperients and hypercatharsis are contra-indicated), and such further remedies as are adapted to the existing state of the system. If nervous symptoms predominate, the treatment prescribed under Mimosis Inquieta; if the patient be pale and anæmic, the treatment proper to Anæmia. If ascarides be present, the remedies for the removal of the same. Piles require the treatment recommended at p. 519. If cutaneous eruptions near the parts of generation be the cause of irritation, these will require the treatment proper to the particular skin disease. Prostatic disease, stricture of the rectum or urethra, and fissures and painful tumours on the anus, require the interference of the surgeon. The careful avoidance by patients suffering from this disease of advertising quacks cannot be too strongly insisted upon.

CHAPTER VII.

DISEASES OF THE ORGANS OF SENSE.

1. Diseases of the Eye.
2. Diseases of the Ear.

DISEASES OF THE EYE.

1. Conjunctivitis.
2. Sclerotitis.
3. Corneitis.
4. Iritis.
5. Diseases of the Choroid.
6. Diseases of the Retina.
7. Diseases of the Choroid and Retina.
8. Diseases of the Lens.
9. Staphyloma Posticum.
10. Glaucoma.
11. Other Diseases and Defects of the Eye.

INFLAMMOTION OF THE CONJUNCTIVA.

Species.—1. Catarrhal Ophthalmia. 2. Purulent Ophthalmia of Infants. 3. Purulent Ophthalmia of Adults. 4. Gonorrhœal Ophthalmia. 5. Strumous Ophthalmia.

1. CATARRHAL OPHTHALMIA.

Symptoms.—Redness and itching of the conjunctiva, lachrymation, slight intolerance of light, and stiffness of the globe of the eye, followed by pricking pain, the sensation of a grain of sand beneath the eyelid, and adhesion of the eyelashes, on first waking in the morning. The inflammation begins in the conjunctiva of the lids, and gradually extends towards the cornea. In acute forms of the disease, the whole eye is covered with a vascular network, the secretion becomes puriform or muco-purulent, and patches of extravasated blood are effused beneath the conjunctiva. If the disease extend to the conjunctiva covering the cornea, vision is obscured. There is no constitutional disturbance, beyond the slight feverishness attendant upon the catarrh.

Causes.—Catarrh; a draught of cold air directed on the eye; foreign bodies in the eye; over-exertion of the sight; the glare of a strong light; all the causes of inflammation in other mucous membranes.

DIAGNOSIS.—From *purulent ophthalmia*, except in severe cases, by its milder character, and by not being contagious. From *inflammation of the sclerotic*, by the brighter colour, larger size, and more tortuous course of the vessels, which are obviously superficial, and shift their place with the motions of the eyelids; by the abundant secretion; by the absence of acute pain in and around the orbit; and by the slight intolerance of light, existing chiefly at the onset of the attack.

PROGNOSIS.—*Favourable.* The disease readily yields to treatment, and, when confined to the conjunctiva, does not threaten the loss of vision. In chronic cases, or after repeated attacks, the lids may become thickened, and that part of the membrane which covers the cornea may be rendered opaque, so as to impair the sight.

TREATMENT.—That proper to catarrh. Dover's powder may be given at night, with a saline aperient in the morning; or small doses of tartar-emetic, in combination with a saline aperient, two or three times a day.

The *local* treatment will consist, in severe cases, in the application of a blister, or a few leeches to the temple, with fomentations of warm water or warm decoction of poppies. When the inflammation has in some degree subsided, and in mild cases from the first, collyria (Form. 39) will be needed. A large drop or two (Form. 39) being placed between the lids at the outer angle twice or thrice a day. Adhesion of the eyelids must be prevented by introducing spermaceti or zinc ointment between them at bedtime.

2. PURULENT OPHTHALMIA OF CHILDREN.

SYMPTOMS.—Inflammation in the conjunctiva covering the lids, commencing generally on the third day after birth, and extending over the entire surface of the eye, accompanied by intolerance of light, swelling and firm adhesion of the lids, and a copious discharge of purulent matter, which issues in large quantities on their separation. The membrane is of a bright scarlet colour. The discharge is generally yellow, but sometimes greenish, or tinged with blood; or ichorous. The disease may continue for eight or ten days, without involving the transparent parts of the eye; but if it be not properly treated, ulceration occurs at the circumference of the cornea, which first becomes hazy, then opaque, and finally sloughy and infiltrated with pus. Sooner or later it gives way, and the iris protrudes. If the inflammation of the cornea stop short of ulceration it becomes opaque and usually adherent to the iris.

The constitutional symptoms are restlessness, sleeplessness, and disordered bowels,—results of the prolonged local irritation.

DIAGNOSIS.—There is no other disease of the eyes occurring at this early period with which it can be confounded.

Prognosis.—*Favourable*, so long as the cornea retains its transparency.

Causes.—The application of leucorrhœal or gonorrhœal discharges to the eye, during parturition; contagion.

Treatment.—Few diseases require more assiduous attention, and few so rapidly yield to treatment; neglect for a single day may result in permanent loss of vision. Six times a day the lids must be carefully separated, and the surface of the conjunctivæ freely washed with warm water by means of a syringe, and one or two drops of solution of nitrate of silver (gr. ii to gr. iv to ℥j), or of alum (gr. viii to gr. x to ℥j) dropped into the eye just within the outer canthus. The lids should then be smeared with a little olive oil; and lint wetted with water should be kept constantly applied to them. In chronic cases, when the lids present a granular appearance, they may be touched with the solid nitrate of silver or sulphate of copper.

The bowels should be kept free by gentle aperients of castor-oil, magnesia, or manna.

Prophylaxis.—The greatest care should be taken to prevent the application of the matter to the eyes of other persons.

3. PURULENT OPHTHALMIA OF ADULTS.

Synonym.—Ægyptian ophthalmia.

Symptoms.—The disease generally attacks both eyes, and sets in with a sensation of a foreign body beneath the eyelids, speedily followed by injection of the conjunctiva, effusion of serum beneath it, and a thick puriform discharge from the surface. The conjunctiva is of a bright-red colour, the lids and anterior surface of the eye are swollen and granular, and the cornea is sunk, as it were, into a deep pit formed by the projection of the conjunctiva. There is, here and there, extravasated blood. So long as the conjunctiva alone suffers, the pain is inconsiderable; but when the deeper-seated textures are involved, the pain is extremely severe. In the globe itself, it is a sensation of painful tension, and around the orbit, a pain like that of hemicrania. It is intermittent, or aggravated at intervals, and attains its greatest intensity at night. There is but little intolerance of light in any form of the disease. Rupture of the cornea sometimes takes place with permanent or temporary relief to the pain. The constitutional symptoms are slight; the sleep is disturbed by paroxysms of pain.

Terminations.—In resolution; chronic inflammation; granular conjunctiva; opacity; ulceration or sloughing of the cornea; staphyloma; prolapsis of the iris. The disease is very apt to recur.

Causes.—Contagion. The common causes of inflammation.

DIAGNOSIS.—From *catarrhal ophthalmia* by its greater severity, and the greater tendency to attack the deeper-seated parts. From diseases affecting the deeper-seated tissues alone, by the presence of severe inflammation of the conjunctiva.

PROGNOSIS.—*Unfavourable*, when very severe, or neglected at its outset. From its tendency to attack the deeper-seated structures of the eye, loss of vision, or at least injury to the sight, may be anticipated.

TREATMENT.—Leeches round the orbit; free scarification, followed by strong astringents (Form. 182). In chronic cases, the vinum opii may be used with advantage. Previous to the application the surface of the eye should be carefully cleansed by a syringe. Aperients should be administered at the outset; the patient should be put on a spare diet, and enjoined to take gentle exercise in the open air. When the deeper-seated textures of the eye are implicated, the remedies appropriate to the inflammations of those textures should be employed; such as the belladonna ointment in threatened adhesion of the iris; puncturing the cornea to prevent rupture of the membrane; the application of nitrate of silver to ulcers on the cornea, or to the protruding iris.

PROPHYLAXIS.—Great care should be taken to prevent the application of the matter to the eyes of healthy persons.

4. GONORRHŒAL OPHTHALMIA.

SYMPTOMS AND TREATMENT.—Those of purulent ophthalmia of adults; but it is more severe and much more rapid: a few hours may suffice for its complete development. In order to arrest it, we may pass solid nitrate of silver rapidly over the inflamed conjunctiva.

CAUSE.—Inoculation of the eye with gonorrhœal matter.

5. STRUMOUS OPHTHALMIA.

SYNONYMS.—Scrofulous, pustular, and phlyctenular ophthalmia.

SYMPTOMS.—This disease attacks children from the period of weaning, to eight or nine years of age, and sometimes up to puberty. There is slight and partial redness of one, or of both eyes, sometimes confined to the eyelids, and caused by groups of enlarged vessels running from the circumference of the eye to the edge of the cornea, where they terminate in small pustules, which break and form minute ulcers. Sometimes the injection extends to the conjunctiva covering the cornea, and pustules form on its surface. There is great intolerance of light, the eyebrows are contracted, and the nostrils and upper lip drawn upwards. Whenever the eye is exposed to light, there is a profuse discharge of scalding tears, which, flowing over the skin, irritate and inflame it.

The symptoms remit towards evening. The constitutional symptoms are those of scrofula, such as glandular enlargements, eruptions on the head and face, sore ears, general debility, tumid belly, disordered bowels, offensive breath.

CAUSES.—*Predisposing.* The scrofulous diathesis, and all the circumstances calculated to call it into action.—*Exciting.* The common causes of inflammation; catarrhal ophthalmia; the exanthemata.

DIAGNOSIS.—From catarrhal ophthalmia, by the more partial injection of the vessels, the greater intolerance of light, the formation of distinct pustules, and the presence of other symptoms of scrofula. From purulent ophthalmia, by the watery discharge—lachrymation.

PROGNOSIS.—*Favourable*, when the scrofulous taint is slight.—*Unfavourable*, when it is strongly marked.

TERMINATIONS.—In resolution; in the formation of a "vascular speck," or of *pannus;* in ulceration of the cornea, followed in some cases by protrusion of the iris, and its adhesion to the cornea; in infiltration of the cornea.

TREATMENT.—I. *General.* That recommended for scrofula (p. 345). Quinine is a most valuable tonic in this disease. II. *Local.* Warm fomentations to the eye; the instillation of vinum opii two or three times a day, or the use of astringent collyria, with the red precipitate or citrine ointment, placed between the lids at bed-time; and by the counter-irritation of blisters behind the ears, an issue in the arm, or a ring or thread passed through the lobe of the ear. Ulcers on the cornea should be touched with nitrate of silver.

SCLEROTITIS—INFLAMMATION OF THE SCLEROTIC.

SYNONYM.—Rheumatic ophthalmia.

This disease is sometimes limited to the sclerotic, but more frequently coexists with inflammation of the conjunctiva (*catarrho-rheumatic ophthalmia*), or of the iris.

SYMPTOMS.—A deep-seated and dusky redness of the globe of the eye, especially round the cornea, where the radiating straight vessels of the sclerotic are seen abruptly terminating a short distance from its margin. There is an abundant flow of tears, extreme intolerance of light, and a sensation of fulness and tension, with darting pain in the globe, extending round the orbit, in the course of the branches of the fifth nerve, increasing towards evening, attaining its greatest intensity at midnight, and subsiding towards morning. There is generally some degree of haziness of the cornea, and vision is more or less impaired.

TERMINATION.—In recovery, or in chronic disease. If the disease extend to the cornea or iris, the results of inflammation of those parts.

Causes. — *Predisposing.* Middle age; the male sex; a previous attack; the rheumatic or gouty diathesis.—*Exciting.* The common causes of inflammation. The disease is simply local rheumatism.

Diagnosis.—From inflammation of the conjunctiva by the deep-seated redness, radiated arrangement, and hair-like firmness of the vessels; by the secretion of tears in the place of mucus; by the deep-seated pain of the orbit, extending to the surrounding parts; by the intolerance of light; in some cases, by its complication with iritis.

Prognosis.—*Favourable*, if the disease be promptly treated. It is very liable to assume a chronic form, and to return.

Treatment.—An alterative purgative followed by a full dose of the sodæ et potassæ tartras combined with ♏xv vini colchici. Quinine with the vegetable acids. Gr. x pulvis ipecacuanhæ compositi.

A solution of extract of opium to be occasionally dropped into the eye, which should be protected by a shade, or the patient should remain in a darkened room. Warm opium fomentation. Unguentum belladonnæ should be rubbed into the forehead, and smeared over the eyelid and brow. Chloroform and opium liniment may be used with the same view. If the inflammation be very acute, leeches to the temple or behind the ears. In obstinate cases of chronic disease, arsenic (Form. 326).

The symptoms, terminations, and treatment of the disease are those of catarrhal inflammation of the conjunctiva, combined with those proper to rheumatic inflammation of the sclerotic.

CORNEITIS—INFLAMMATION OF THE CORNEA.

Symptoms.—The disease begins with a slight haze on the cornea, which gradually increases till it amounts to opacity. Numerous minute ulcers now form on the surface, and the vessels of the conjunctiva and sclerotic become injected; those of the conjunctiva ramifying over the surface of the cornea, and those of the sclerotic being arranged in the characteristic radiated form round the margin of the cornea. Depositions of lymph between the layers of the cornea are also of frequent occurrence; and the secretion of the aqueous humour being augmented, increases the convexity of the membrane. During the progress of the disease pus may form within the layers of the cornea, appearing as a yellowish-white spot. In such a case the posterior lamina may give way, when the pus is discharged into the anterior chamber and sinks down to the lower part, forming a yellow crescent (hypopyon); or the fibres of the anterior elastic lamina may be destroyed and a minute ulcer result. Such ulcers readily heal; but the cicatrix always remains opaque. There is generally considerable lachrymation and intolerance of light. The pain is usually slight, except occasionally in the first stage, when there is a sense of tension in the eye, with darting pains in the forehead.

DIAGNOSIS.—From other chronic affections of the eye, by a plexus of very fine vessels arranged in the form of a crescent at the edge of the cornea. Sometimes these vessels form an almost complete circle.

PROGNOSIS.—*Unfavourable*, when the general health is impaired.

TREATMENT.—That recommended under Sclerotitis. Quinine is particularly useful in this, as in strumous ophthalmia. Should inflammation of the surrounding textures, and of the iris, take place, the treatment proper to iritis will become necessary.

IRITIS—INFLAMMATION OF THE IRIS.

SPECIES.—Idiopathic. Specific.

IDIOPATHIC IRITIS.

SYMPTOMS.—The disease begins by the formation of a red zone of small, straight, parallel vessels, arranged as radii round the circumference of the cornea, and terminating abruptly near its edge, the redness after a time extending to the conjunctiva. The iris loses its brilliancy, becomes muddy, and of a tint formed by blending a red with its original hue ; its texture is at the same time impaired or destroyed, and lymph is largely effused into its substance from its edge, or its anterior or posterior surface, or in all these situations. Sometimes the quantity effused is so large as to fill the chambers of the eye. The movements of the iris are at first impeded, and then suspended ; the pupil contracts, and becomes irregular in shape, from effusion into its substance and adhesion to surrounding parts. There is dimness, and at length complete loss, of vision ; and generally severe pain in and round the orbit, darting to the cheek and temple, and worse at night.

DIAGNOSIS.—By the change of colour of the iris, the irregular pupil, and the effusion of lymph behind the cornea.

PROGNOSIS.—*Unfavourable*, when the treatment has been delayed. A contracted pupil, great vascularity, acute and deep-seated pain, dimness of vision, or insensibility to light.—*Favourable*, in mild cases, and in acute cases, promptly treated.

CAUSES.—Mechanical injuries, surgical operations, over-exertion of the eyes, and the common causes of inflammation.

TREATMENT.—*Indications*. I. To subdue inflammation. II. To prevent the effusion, and promote the absorption of lymph. III. To dilate the pupil and prevent the formation of adhesions.

I. Leeches to the temple, brisk aperients, a strict antiphlogistic regimen, the exclusion of light, and perfect rest.

II. To fulfil this indication, calomel and opium must be given from the outset, in doses of gr. $\frac{1}{2}$ to gr. i, with from a quarter to half a grain of opium, every three, four, or six hours, according to the severity of the symptoms; combined, in very severe cases, with mercurial inunction. The calomel and opium may be advantageously combined with tartar-emetic in the dose of from a sixth to a quarter of a grain.

III. This indication is fulfilled by occasionally dropping a little liquor atropiæ into the eye.

SPECIFIC IRITIS.

VARIETIES.—Syphilitic; Rheumatic; Arthritic; Strumous.

SYPHILITIC IRITIS.—The *symptoms* resemble those of idiopathic iritis, but generally come on slowly and insidiously. When fully established, the disease may prove highly destructive. The *cause*, as the name implies, is the syphilitic virus. The disease may occur alone; or in combination with other secondary symptoms; and it may make its appearance during the existence of the primary disorder. The *diagnosis* turns on the position in which the lymph is effused, and on its appearance. It is thrown out on the margin of the iris in the form of globules or distinct masses, of a reddish, brownish, or brownish-yellow colour, sometimes described as tubercles. At the same time the pupil is displaced upwards and inwards, the sclerotic zone is of a cinnamon colour, and small brown spots form on the cornea. The *treatment* consists in inducing the constitutional effects of mercury, as speedily as possible, by the exhibition of calomel and opium, and the infriction of mercurial ointment into the armpits or groins. Atropia must be used to dilate the pupil.

RHEUMATIC IRITIS.—The *symptoms* are usually associated with those of sclerotitis (see p. 589). The sclerotic, however, has a peculiar purplish hue, and the radiating vessels stop within one or two lines of the margin of the cornea, leaving a bluish-white ring around it,—appearances which are characteristic of this affection. Blood-vessels become visible in the iris. Deposition of fibrin is rare; and when it does occur is small in quantity, and effused round the pupillary margin.

CAUSE.—Exposure of the eye to a draught of cold air.

TREATMENT.—That of sclerotitis (see page 589), care being taken to prevent adhesion of the iris to the capsule of the lens by the use of liquor atropiæ. Mercury is of little or no use in this form of disease.

ARTHRITIC IRITIS.—The disease occurs in persons subject to gout, or of gouty constitution, when weakened by abstinence, or other occasional cause of debility. The *symptoms* resemble those of rheumatic iritis. The disease is very apt to recur. The general *treatment* of the acute disease is that of rheumatic iritis and gout.

STRUMOUS IRITIS.—This form is generally the result of an extension of strumous ophthalmia to the deeper-seated structures, and is chronic and obstinate. The constitutional treatment is that of scrofula; the local treatment being determined by the degree and extent of the inflammation. Solution of atropia must be used as in the other forms of iritis.

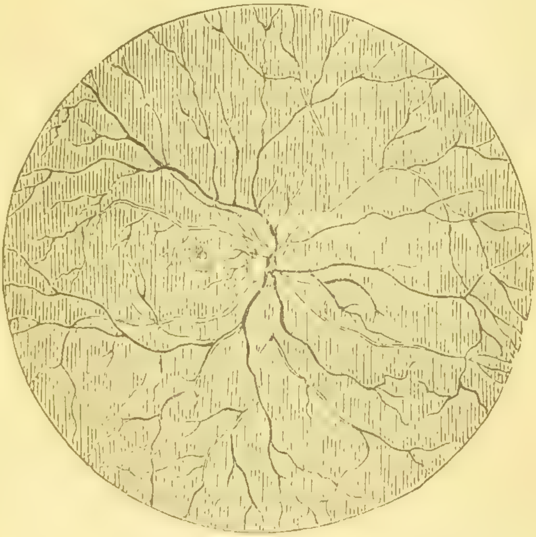
USE OF THE OPHTHALMOSCOPE.

In order to ascertain the state of the deeper structures of the eye, the ophthalmoscope is indispensable, and a few words on its management will not be out of place here.

If we wish to explore the whole fundus of the eye, the pupil must be well dilated by instilling a few drops of solution of atropine. But as the pupil does not regain its contractility for some time, we must use the solution as seldom as possible, and we may even dispense with it when a glance at the optic nerve and the parts immediately surrounding it is all that is wanted. Let the patient be seated in a dark room, and place an argand gas-light, or moderator lamp, just behind his shoulder and close to the side of his head, so that the light is on a level with the eye and so far behind it that the face is in the shade. Stand or sit opposite the patient, apply the ophthalmoscope to your own eye, at a distance of eighteen inches from the eye of the patient, and, looking attentively through the sighthole, direct the rays reflected from its mirrored surface so as to fall on the patient's eye. Next interpose the lens at the distance of about an inch in front of the patient's eye, and then by a slight backward and forward movement of your own head and the speculum together, catch the proper focal distance, and the image of the fundus of the eye will appear as a reddish glow. On careful examination, the following parts may be distinctly made out:—

Normal Appearance of the Fundus of the Eye.—Figs. 79 and 80.—The *entrance of the optic nerve* (optic disc, optic papilla) is seen as a white or rosy-tinted circular spot limited by a sharp, well-defined, circular line, formed internally of the margin of the choroid, externally of the margin of the sclerotic. The margin is slightly raised above the general concavity of the fundus, while its central parts are slightly depressed below it. A little to the inside of the optic entrance the *yellow spot* may be seen: it is the darkest part of the fundus, forming a dusky oval or roundish patch, as large as, or smaller

Fig. 79.*



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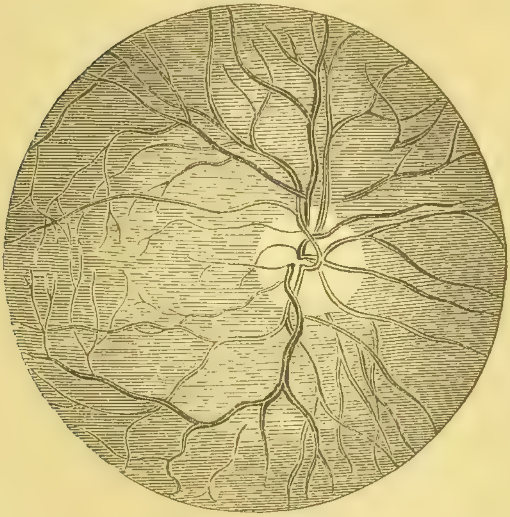
* Fig. 79 represents the retina spread open; the parts are of natural size; the yellow spot, and a little below and to the inner side, the optic nerve entrance and the retinal vessels are seen.

than, the optic entrance. In the centre may be distinguished a small bright dot, the *fovea centralis*. The optic entrance and yellow spot are surrounded by an orange-red field, varying in intensity of colour according to the complexion, and pervaded by the retinal vessels. The *retinal artery and vein*, in obtaining entrance into the eye, perforate the optic entrance, where each consists of from one to three trunks; the artery is distinguished from the vein by its smaller size, its scarlet colour, and its dichotomous ramifications. The veins are more tortuous, and receive branches at considerable angles. Leaving the optic entrance, these vessels are seen to ramify freely over the surface of the retina, diverging above and below the yellow spot so as to avoid it, and spreading their fine terminal branches towards the anterior edge of the retina.

Fig. 80.*



The different parts of the fundus are successively brought into view as the patient moves his eye outwards or inwards, downwards or upwards. The yellow spot, being in the axis of the eye, will be seen when it is directed straight forward; the optic entrance, which is $\frac{1}{10}$ of an inch internal to and a little below the yellow spot, will be visible when the eye is rolled a little inwards. During the examination of a particular part of the fundus, the patient should be directed to fix his eye on a number, marked in large characters on a screen.

In dark-complexioned persons the *choroid vessels* cannot be distinguished; but in those who have light hair and blue eyes, they may be readily seen, and even the arrangement of the *vasa vorticosa* observed.

In Albinos it is possible to see, through the choroid, the ciliary arteries in the *sclerotic*.

DISEASES OF THE CHOROID.

This membrane being essentially composed of a fine network of delicate blood-vessels, is liable, not only to participate in several constitutional diseases, but also to implicate in its own disorders those important parts of the eye which are dependent on it for nutrition or otherwise intimately associated with it. Lying between the sclerotic and retina, and forming anteriorly the choroid body and the iris, every change of the choroid must, in a lesser or greater degree, affect these continuous and contiguous parts also.

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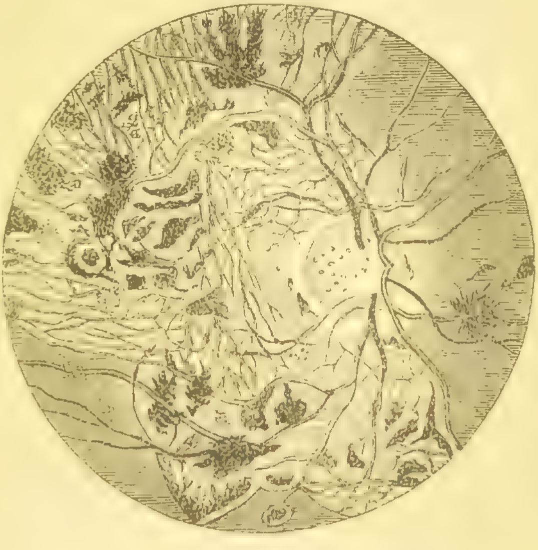
* Fig. 80 represents the healthy fundus as magnified by the ordinary lens: the optic nerve entrance, and the distribution of the retinal artery and nerve are shown.

CONGESTION OF THE CHOROID.—*Morbid Appearances.* Increased redness of the fundus, and enlargement, with more or less tortuosity of the blood-vessels. As the colour of the fundus varies in intensity in different people, we can only diagnose the condition satisfactorily by a comparative examination of both eyes.

Symptoms.—Pain, or aching fulness, intolerance of light, lachrymation.

INFLAMMATION.—*Morbid Appearances.* Those of congestion in a higher degree, with effusion, either between the choroid and sclerotic, or between the choroid and retina, or bursting through the latter and escaping into the vitreous humour. The choroid itself may be swollen and opaque from interstitial effusion. In the disseminated and syphilitic varieties white patches or rounded spots of effusion, and black spots, composed of masses of pigment epithelium, are seen on the surface of the choroid. Capillary hæmorrhage is not common; when it does occur the extravasation is more extensive and less defined than when occurring in the retina. The effused serum in front of the choroid may be deeply stained with blood. If the inflammation continue it soon affects the vitreous humour, which becomes hazy. If the effused products have been limited to the substance of the choroid, they may be absorbed, and the eye recover. If the inflammation take on the suppurative form, it may rapidly spread and disorganize the whole eye. Recovery is generally incomplete, for as the exsudation is removed, the choroid undergoes *atrophy*, the pigment cells are destroyed at the points where the inflammation developed itself, and corresponding parts of the surface of the white sclerotic are exposed. The fundus therefore presents yellowish-white patches with ragged margins, bounded by, and dappled over with, the black unaltered choroidal epithelium. If

Fig. 81.



the inflammation have been more diffuse, only small black islands of unaltered pigment are left scattered over the pale fundus. The retinal vessels are seen undisturbed in front of this mottled field. (Fig. 81.)

Symptoms.—Those of congestion of the choroid, but more intense.

The external symptoms are usually little marked. In some cases there is no external indication of disease. When the ciliary processes are involved, there is vascularity of the corresponding part of the sclerotic, and fulness of the veins. The pupil is usually inactive.

Terminations.—Staphylomatous protrusions of the sclerotic, forming blue tumours close to the margin of the cornea. Glaucoma is no doubt a frequent result of choroiditis.

Treatment.—In congestion of the choroid the patient should avoid bright light, read little, and use large type. The cold douche should be frequently applied to the eyes, and occasionally to the whole head. If debility be present, quinine with mineral acids or the astringent chalybeates. When inflammation occurs, leeches or blisters to the temples; calomel and opium given to slightly affect the gums; and exclusion from light.

DISEASES OF THE RETINA.

Anæmia may arise from a general anæmic condition or from the obstruction of the retinal artery by an embolus. In the first case there is simple pallor of the optic disc, rendering the veins very conspicuous. The *symptoms* are fatigue and dimness of vision. When it arises from blockade of the retinal artery, its branches are seen empty and contracted and the veins collapsed. Blindness, occurring suddenly, is the result.

ATROPHY OF THE OPTIC DISC AND RETINA.—Optic disc atrophied, sunken, pearly white, and very conspicuous; retinal vessels contracted. Retina near optic disc and yellow spot opaque and white. This condition is indicative of atrophy of the intercranial portion of the optic nerve constituting the so-called "cranial amaurosis."

Symptoms.—Obscurity of vision coming on gradually or suddenly, followed by insensibility of the greater portion of the retina. The fingers can be dimly seen only in a certain limited position.

IMBIBITION AND SWELLING OF THE OPTIC NERVE, WITH FATTY DEGENERATION OF THE RETINA.—*Morbid Appearances.* Spots of an intense white colour streaking the optic disc, indicating commencing induration of the nerve fibres; small white points grouped in the form of a star near the yellow spot, resulting from fatty degeneration of the anterior extremities of the radial fibres of the retina. Numerous minute linear extravasations of blood lie between the altered fibres, and give a more decided appearance of radiation to the diseased patch of retina. In a more advanced stage, the swelling of the optic disc almost disappears, and the fundus is occupied by a patch of pearly whiteness, spotted and striated here and there, by minute extravasations, and limited by an irregular dotted margin. The degenerate arteries and tortuous veins appear very distinct as they radiate over this mottled white field.

Symptoms.—Dimness of vision gradually increasing to complete blindness, without pain or external symptoms.

Cause.—"This condition of the retina is so characteristic of Bright's disease that it allows one, by ophthalmoscopic examination alone, to recognise with certainty the affection of the kidney." (Liebreich, Atlas der Ophthalmoscopie, p. 25.)

RETINITIS.—*Morbid Appearances.* Redness of the optic disc, becoming intense, obscuring its outline, and gradually increasing until it is lost to view; retinal veins enlarged and varicose. Sometimes the fundus is dotted over with red spots of blood; thickening of the retina by serous infiltration, and diminution of its transparency, so that the deeper portions of the veins cannot be seen, and they have the appearance of being interrupted. In proportion to the quantity and density of the opaque inflammatory products, the red colour of the choroid becomes dimmed, and at last obscured, so that the retina is alone seen. It is of a dull drab or grey colour, and may present here and there patches of ecchymosis.

In the *syphilitic variety* the affected portion of the retina is rendered opaque by solid effusion forming a white patch, stretching from the obscure margin of the optic disc round the yellow spot, and thence spreading as a streak towards the circumference. It is distinguished from the degeneration occurring in Bright's disease, by the absence of the sharp definition and vivid whiteness.

Symptoms.—Dim and distorted vision, lines appear zigzagged, and vertical objects out of the perpendicular; occasionally fiery flashes are noticed; there is often considerable pain in the head.

Causes.—Strong light; the heat and light of large fires; light reflected from snow or sand; lightning; overstraining the eye in examining very minute objects.

Treatment.—That of local inflammation. Quinine should be given early. If there be syphilitic taint, the treatment given p. 582.

RETINAL HÆMORRHAGE (Retinal apoplexy).—*Morbid Appearances.* Extravasation of blood in spots, streaks, or patches. The effusion may take place between the layers of the retina; upon its surface, between it and the lining membrane; or it may rupture the latter, and pass into the vitreous humour. When recent, the colour of the effusion is crimson, afterwards black or brown.

Symptoms.—More or less imperfect vision coming on suddenly after exertion in a stooping posture, or after a blow on the globe of the eye. Only the half of an object may be seen. There are usually dilatation, sluggish action, or immobility of pupil. Small objects cannot be distinguished; but light, and large objects often appear of a deep red tint. Except in case of violence, there is no pain or intolerance of light.

Causes.—Violent straining, congestion of the retina; suppression of the menses; degeneration of the coats of the retinal vessels; blows of the eyeball; convulsions; apoplexy; Bright's disease.

Prognosis.—Dependent upon the cause. *Favourable* if the patient be young, and the effusion small. *Unfavourable* in proportion to the amount of direct violence, to the imperfection of vision, to the inactivity of the iris, and to the presence of intra-ocular or intercranial pain.

Treatment.—Leeches to the temples, a brisk hydragogue purgative, and the constant application of cold to the eye. If pain be present, opium may be given. If light be intolerable, the patient must be kept in the dark; and in every case direct light must be avoided. The sound eye must not be used in reading or fine work.

Under the most favourable circumstances, the effusion is slowly absorbed and the function of the retina tardily restored.

DISEASES OF THE CHOROID AND RETINA.

CHOROIDO-RETINITIS PIGMENTOSA.—*Morbid Appearances.*—Those of atrophy. The choroid and retina are atrophied, speckled with pigment, and unnaturally adherent. The disease is characterised by commencing in a more or less complete circle at the ora serrata (ant. margin of retina), and spreading backwards towards the optic disc, which ultimately becomes implicated in the atrophy.

Symptoms.—A general contraction of the field of vision, while the central parts retain their clearness; in two words—circumferential blindness. When the disease has made considerable advance towards the centre, night blindness occurs. The progress of the disease is often very slow, and there are no external evidences of its presence. As the fundus becomes affected, blindness creeps on, and the pupil becomes large and inactive. Total blindness at last results.

Causes.—Chronic inflammation and defective nutrition.

DETACHMENT OF THE RETINA FROM THE CHOROID) FLOATING RETINA).—*Morbid Appearances.* If the displacement be extensive, it is readily observed; if slight it is ascertained with difficulty. It is first seen at the lowest part of the fundus, probably in consequence of the gravitation of the effused fluid. If this be serum, the detached retina projects into the vitreous humour as a tense vesicle, or folded membrane which vibrates or undulates with every movement of the eyeball. The limit of detachment is marked by the sudden bending of the vessels and by a diminution in the colour of that portion of the fundus which is detached. In the earlier stages the colour of the choroid is transmitted through the retina, which still retains its natural transparency. In long-standing cases the detached retina becomes pearly white and opaque, and the colour of the choroid is no longer apparent. The separation of the retina may be partial, or it may increase until it is wholly disunited from the choroid. It is then pushed forwards in the form of an irregular hollow cone, the apex of which is formed by the optic disc. In extreme cases it is reduced to a mere translucent cord traversing the posterior part of the axis of the globe.

Symptoms.—The disease comes on so insidiously, that the blindness caused by the disease is often discovered accidentally. There is no pain, and the appearance of the eye is quite natural. If the condition be manifest, then obliteration of the field of vision, corresponding to the limited detachment of the retina, is observed. If the *lower* half of the nervous layer be detached, then the field of vision is terminated by an irregular horizontal line, *above* which is darkness.

Diagnosis.—Cancerous tumours of the choroid may coexist, and be overlooked, in this condition of the retina. Effusions into and opacities of the vitreous membrane may be mistaken for it; the absence of these latter conditions is determined by the appearance of the retinal vessels in the projection.

Cause.—Inflammation of the retina or choroid.

Treatment.—If the retina be wholly detached, the sight will never be regained. In cases of partial separation, the absorption will be promoted by the repeated application of blisters to the temple, and a prolonged course of iodide of iron.

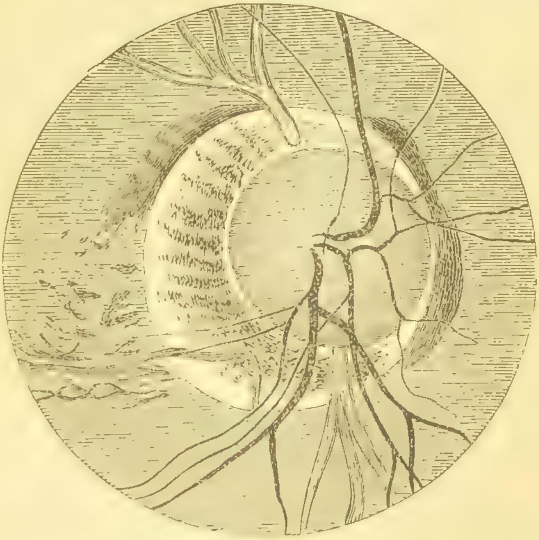
DISEASES OF THE SCLEROTIC AND CHOROID.

STAPHYLOMA POSTICUM (SCLERECTASIA. SCLEROTICO-CHOROIDITIS POSTERIOR).

Definition.—A conical protrusion backwards, of a portion of the sclerotic, in the neighbourhood of the optic nerve, usually on its outer side, involving the choroid and retina.

Morbid Appearances.—A clear zone surrounding the optic nerve (Fig. 82), caused by removal of pigment from the atrophied choroid, which no longer prevents a view of the white sclerotic behind. The zone grows whiter as the disease advances, and greyish streaks or spots are observed in it. At first the zone is incomplete, and in the form of a crescent joined by its concave edge to the optic nerve. As the atrophy

Fig. 82.



of the choroid proceeds farther outwards, the white or mottled zone spreads in a more or less circular form. (Fig. 84.)

In more advanced stages the circular outline is lost, the atrophied choroid extending into rounded or oblong processes. (Fig. 83.)

Fig. 83.

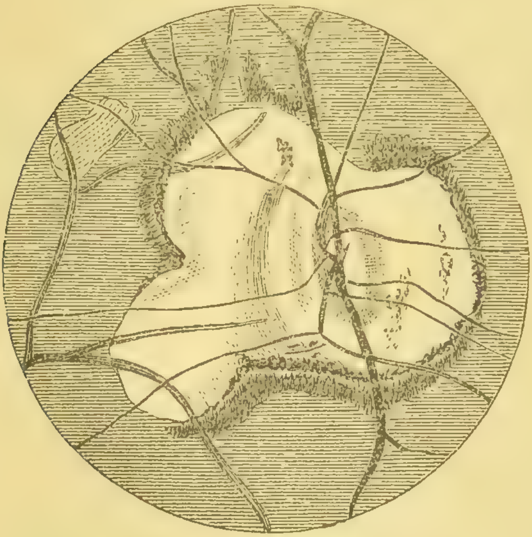
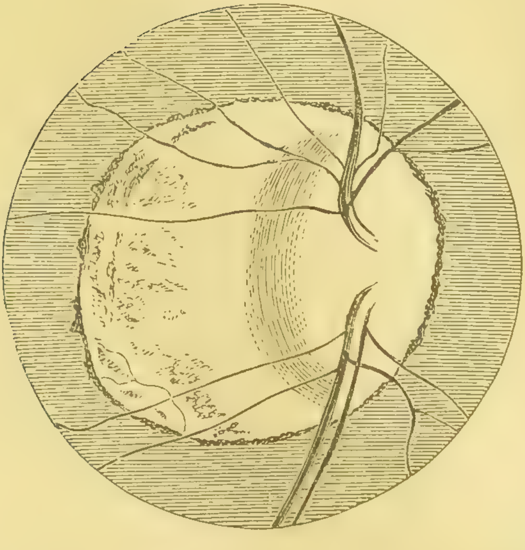


Fig. 84.



The white crescentic figure so characteristic of this disease is the inner surface of the protruded sclerotic. When the staphyloma is deep, the adjacent portion of the sclero-choroidal ring bounding the optic nerve is obliterated, and the corresponding side of the optic nerve entrance is pulled down into the hollow. When this has happened the nerve entrance is seen in perspective, and its figure is consequently elliptical in proportion as it slopes into the hollow. When the staphyloma is to the side of the optic nerve, the major axis of the ellipse will of course be vertical. This condition is well represented in Fig. 83.

Symptom.— Posterior staphyloma is the most frequent cause of myopia (short sight). When the yellow spot becomes involved in the disease amblyopia results.

Diagnosis.— The white crescentic figure near the optic nerve; unusual distinctness of the retinal vessels ramifying in front of a white ground; and their undulatory course from the nerve entrance across the depression, are positive marks of posterior staphyloma.

Cause.—According to Von Ammon there exists in an early stage of fœtal life a protuberance of the sclerotic on the outer side of the optic nerve which communicates with the anterior cerebral vesicle by means of an oval opening. There is therefore a natural tendency to this defect, and a very slight accident or arrest of development may cause it. Atrophy of the choroid, resulting in wasting, and distension of the sclerotic, may produce it in after life.

Treatment.—The defect of vision to be remedied by the use of concave glasses, of suitable power.

DISEASES OF THE LENS.

Every morbid process that affects the lens results in more or less irremediable opacity, and bears the name of "cataract." It is conveniently divided into *lenticular* and *capsular*, according as it affects the lens and its capsule respectively.

CONGENITAL CATARACT.—Four varieties. I. A minute chalky-white dot, deposited in the most superficial part of the lens within the capsule, and occupying the centre of a clear dark pupil (Cat. centralis). II. A more extensive deposit occupying nearly the whole area of the pupil; it has a conical shape, with the apex directed forwards (C. pyramidata). III. A greyish-white opacity composed of faint striæ, terminating in a little opaque white dot. IV. Irregular fatty or earthy patches, affecting either the anterior or posterior surface of the capsule. These opacities are circumscribed, the rest of the lens remaining perfectly clear: they do not extend, and when small do not prevent sight. When large they require surgical interference. They are diagnosed from diseases of deeper structures by their brilliant white colour and comparatively superficial position. Morbid deposits in the fundus of the eye have a yellow colour. Congenital cataract, as a rule, affects both eyes. The *symptoms* attendant upon these conditions are, more or less cloudiness of vision and inability to distinguish type; but when the pupil is dilated with atropia, the most perfect and minute vision.

CATARACT IN ADULTS AND OLD PERSONS.—Complete opacity of lens, except from injury; is rare before forty. After fifty it is the commonest cause of failing sight. The *hard* variety spreads inwards from circumference to centre. Opaque streaks first appear at the extreme edge of the lens, which gradually coalesce into patches and spread in a radiating manner, first and chiefly over the posterior surface, and at a later period involving the anterior surface. After a year or more the whole lens becomes a little hazy, and opaque streaks begin to appear within the margin of the pupil, and converge to the central line of vision; and slowly the pupil changes from black to milk-white, and the opacity is complete. In rare instances the opaque lens becomes deep-brown.

In the *fluid* form of cataract, no converging streaks are seen; the morbid process is one of softening, which goes on till the whole lens becomes a white, bluish-white, or dirty grey pultaceous matter.

GLAUCOMA.

VARIETIES.—Acute and chronic.

DEFINITION.—Inflammation of the interior of the eye leading to effusion of fluid within the eyeball, and destructive distension.

SYMPTOMS.—These come on between the ages of fifty and sixty, and both eyes are usually affected. In the *acute* form the disease begins with sudden and violent pain in the eyeball and temple, followed by rapid extinction of vision; the pupil is widely dilated, motionless, sometimes transversely oval, and of a greenish tint; the iris bulges forward, and its veins are often distinctly enlarged; the lens is hazy or even milky, and advanced almost to the posterior surface of the cornea; cornea dull; the sclerotic and conjunctiva behind the margin of the cornea are congested. The globe feels very hard, and is tender.

The *chronic* form begins very insidiously; dimness of sight, dull aching pain in the eye or head, and flashes of light across the field of vision, sooner or later indicate the progress of internal disease. The patient becomes gradually blind, the pupil enlarged and insensible, and the eye ultimately assumes the appearances above described, but the distended globe is not painful on pressure. Chronic iritis and cataract appear sooner or later, and large dark purple veins show themselves on the sclerotic.

When the eyeball is distended by effusion, the termination of the optic nerve losing the support of the sclerotic, is the first part to yield to the pressure, and, as it is pushed backwards, there is a corresponding depression of the optic disc. This condition is distinctiv marked by the appearance of the blood-vessels in the optic disc and at its margins. At the bottom of the depression the main trunks are spread out, and appear smaller and quite unconnected with their larger prolongations at the margin of the excavation. By focussing the vessels at the bottom of the depression, and then gradually advancing the lens, so as to advance the focus, we may trace the continuity of the central and peripheral trunks, and, at the same time, measure approximately the depth of the depression. Extravasations of blood in the retina are very common.

CAUSE.—Inflammation, probably commencing in the choroid.

PROGNOSIS.—Extremely unfavourable.

TREATMENT.—Mercurial salivation does not appear to arrest the progress of the disease. In the *acute* form leeches, and subsequently blisters, to the temples; cold affusions to the head; opium, and quinine in full doses; an occasional brisk purgative.

The *chronic* disease has been much alleviated, and sight partially restored by extraction of the lens and excision of a portion of the iris.

SPECIFIC DISEASES OF THE EYE.

The internal tunics of the eye are often the seat of cancerous and tubercular deposits, and the lens, vitreous humour, and anterior and posterior chambers are sometimes occupied by parasites (Cysticercus tenuicollis, Filaria oculi, and Distomum ophthalmobium). It is important to be able to recognise a *melanotic growth* in the earliest stages of its existence, in order that the eyeball may be extirpated, and the disease thus removed before it has involved other structures behind the globe. Dull pain, increasing dimness of vision, or dilated and sluggish pupil, a bright metallic reflection from the fundus, and the appearance of a vascular tumour projecting into the vitreous humour, are the symptoms of the disease.

The diagnosis of cancer mainly rests on the presence of blood-vessels different in their arrangement, or distinct from those of the retina. But medullary and melanotic cancer often have their seat in the choroid, and then the retina is pushed forwards and the ophthalmoscopic indications are not diagnostic.

Tubercular deposit forms a bright yellowish *non-vascular* tumour.

Entozoa may be distinguished by their form and movements.

AMAUROSIS.—GUTTA SERENA.

Although this indefinite term is well-nigh obsolete, we may conveniently use it here for the purpose of enumerating all causes of blindness, except those which are discoverable by the unaided eye, such as opacities of the cornea and lens.

Amaurosis may be subdivided into two kinds: 1. Temporary or functional. 2. Permanent or organic.

Temporary amaurosis is due to the following causes:—Exposure to intense light, loss of blood, diphtheria.

Permanent amaurosis may be due either to interocular or to intercranial disease. In the former case it is caused by fatty degeneration of the retina, as in Bright's disease; retinitis; retinal hæmorrhage; choroiditis with effusion of serum or blood, causing detachment of the retina; scrofulous or melanotic tumours, immediately behind or in front of the retina; glaucoma.

Intercranial amaurosis may be caused by pressure upon or atrophy of any portion of the optic nerves, or of those parts of the optic thalami and corpora geniculata in which they have their origin.

The ophthalmoscope will generally enable us to discover the cause of the blindness. If the disease be intercranial, the optic nerve entrance will afford characteristic indications. (See Atrophy of Optic Disc, p. 596.) The treatment must be determined by the cause.

DEFECTS AND DISPROPORTION OF THE REFRACTIVE MEDIA OF THE EYE.

Such defects as the following are very common; and since some are remediable, while others occasionally give rise to alarm, it is necessary that the practitioner should be familiar with them.

ASTIGMATISM.—Under this title Donders, "Accommodation and Refraction," includes those phenomena which result from inequality of the refractive media. The error chiefly lies in the cornea itself, which, on account of variation in thickness or density, produces the same effect upon vision as an unsmooth pane of crown glass interposed between the eye and a distant object. The rays of light being unequally refracted as they pass through the several parts of the unequal cornea, straight lines cease to be parallel, but become zigzagged and broken, and circles lose the even outline;—in a word, a straight line appears broken, and a circular spot unsymmetrical.

MYOPIA.—*Short sight.* An inability to distinguish near objects at the usual distance from the eye. It is caused by undue convexity of the refracting media, whereby the image of an object held at the usual distance is brought to a focus at a point in front of the retina; and in order to throw the image further back upon the retina, the object must be approximated to the eye.

Anything which causes a prolongation of the visual axis must result in myopia. According to Liebreich, Donders, and others, posterior staphyloma (see p. 599) is the most frequent cause of this defect."

Myopia is remedied by the use of biconcave glasses of such a focus that distant objects shall appear distinct and undiminished in size.

PRESBYOPIA.—*Old* or *long sight.* Inability to discern near objects. This is caused by unduly small convexity of the refracting media, whereby the image of an object held at the usual distance from the eye is brought to a focus at a point behind the retina, and in order to advance it, it is necessary to remove the object to an unusual distance.

This defect is compensated by the use of biconvex glasses of suitable convexity.

MUSCÆ VOLITANTES.—Some persons are annoyed, and for a time alarmed, by minute dark specks or beaded filaments, which, by floating in front of the retinal image, puzzle and constantly threaten to obscure vision. "If the eye be directed towards a clear sky, and then kept steadily fixed, the spots appear to sink slowly downwards. A brisk movement of the eye instantly whisks the little bodies about in various directions, and then as soon as the eye is steadied, they again slowly sail across the field of vision." (Dixon on Diseases of the Eye.) M'Kenzie supposes them to be shadows cast on the retina by minute bodies moving in front of, and almost in contact with, it. They are not symptomatic of any organic disease, and need not excite alarm.

DISEASES OF THE EAR.

1. Otitis Externa . . .	Inflammation of the External Ear.
2. Otitis Interna . . .	Inflammation of the Internal Ear.
3. Surditas	Deafness.

OTITIS EXTERNA—INFLAMMATION OF THE EXTERNAL EAR.

1. ACUTE INFLAMMATION OF THE EXTERNAL EAR.

Symptoms.—Pain in the passage, gradually increasing, and augmented by cold, pressure, and the motions of the jaw; deafness; noises in the ear; redness and swelling of the lining membrane; and after an interval of a few hours, or one or two days, a thin acrid fœtid discharge, often tinged with blood, and becoming puriform. The inflammation is followed by enlargement of the mucous follicles, and terminates by suppuration, ulceration, and the formation of scabs, or of painful granulations.

Termination.—In resolution, or in the chronic form.

Causes.—*Predisposing.* Childhood; the scrofulous diathesis.—*Exciting.* Cold; the introduction of foreign bodies into the ear; the extension of inflammation from surrounding parts; the exanthemata, especially scarlatina.

Treatment.—Poultices and warm fomentations to the ear; the injection of warm water, alone or containing from five to ten grains of acetate of lead to the ounce; in severe cases, leeches behind the ear, blisters over the mastoid process; aperients. If an abscess form, poultices and warm fomentations, to promote suppuration and encourage the discharge.

2. CHRONIC INFLAMMATION OF THE EXTERNAL EAR.

Symptoms.—The same as in Acute Otitis; but less severe.

Treatment.—If the disease be still recent, and the acute stage have only partially subsided, injections of warm water, or of a weak solution of acetate of lead, should be used several times in the day, followed by stronger astringents, such as solutions of alum, sulphate of zinc, and nitrate of silver. If granulations of the mucous membrane have formed, tents of lint or cotton, dipped in zinc ointment, may be introduced into the meatus. The general treatment will consist in the steady use of aperients and alteratives, nourishing diet, pure air, and cleanliness; and if there be much debility, chalybeate tonics. If the discharge should suddenly cease, and symptoms of head affection occur, hot poultices and fomentations should be applied to the external ear, and the treatment for partial encephalitis adopted.

OTITIS INTERNA—INFLAMMATION OF THE INTERNAL EAR.

VARIETIES.—1. Acute. 2. Chronic.

1. ACUTE INFLAMMATION OF THE INTERNAL EAR.

SYMPTOMS.—Acute, deep-seated pain in the ear, and in the head and face of the same side, increased by mastication; a sense of tension in the ear; loud noises; deafness; sometimes swelling of the tonsils, with dull pain or itching at the back of the throat. There is a frequent, quick, and hard pulse, hot skin, anxious countenance, furred tongue, anorexia, general febrile excitement, restlessness, sleeplessness, and, in very severe cases, delirium and convulsions.

TERMINATIONS.—In resolution, with gradual subsidence of the symptoms. In suppuration, attended by throbbing pain and great tension, followed by discharge of matter from the external meatus (the membrana tympani having been ruptured) through the Eustachian tube into the throat, or through an opening in the mastoid process.

CAUSES.—Those of inflammation of the external ear; the extension of inflammation from the throat through the Eustachian tube.

DIAGNOSIS.—From inflammation of the external ear by the deeper-seated pain, the absence of discharge from the external meatus in the early stage, and the results of an examination of the external ear. The rupture of the membrana tympani may be recognised by the speculum; and if the patient expire forcibly, the mouth and nostrils being closed, air will issue from the ear.

PROGNOSIS.—Deafness is a very common consequence of this disease; and inflammation of the dura mater, and other membranes of the brain, an occasional result.

TREATMENT.—Bleeding, followed by cupping or leeches behind the ear, and counter-irritation, by blisters or tartar-emetic ointment aperients. If suppuration have taken place, and there be extreme tension, with throbbing pain in the ear, and violent headache and delirium, instantaneous relief may be afforded by puncturing the membrana tympani, washing the ear out repeatedly with tepid water, and facilitating the discharge of matter, by causing the patient to lie on the affected side. If there be swelling or inflammation in the fauces, astringent gargles should be used, or the steam of warm water inhaled. If there be reason to believe that the Eustachian tube is obstructed, the air-douche or the ear-catheter may be employed.

2. CHRONIC INFLAMMATION OF THE INTERNAL EAR.

Symptoms.—The principal symptom of chronic inflammation of the ear, whether external or internal, is a discharge of mucus, muco-purulent, or purulent matter (otorrhœa), from the external meatus, with deafness more or less complete.

Terminations.—In caries of the temporal bone; destruction of the bones of the ear; or permanent deafness; partial encephalitis.

Treatment.—The same as in chronic inflammation of the external ear, combined with the use of gargles, the air-douche, or the ear-catheter. The purely medical treatment will be regulated by the existing state of the constitution. If it be connected with scrofula or syphilis, the remedies proper to those diseases; if combined with skin diseases affecting the head and face, the remedies required by the particular form of skin disease; if with a deranged state of the digestive organs, aperients and alteratives. Wholesome diet, cleanliness, pure air, proper exercise, and a strict attention to the state of the bowels, with tonics and alteratives, are requisite in all forms of the disease.

SURDITAS—DEAFNESS.

Causes.—Congenital absence, or excessive contraction of the external meatus. Accumulation of wax; inflammation and swelling of the meatus; mucous tumours (polypi); osseous tumours; foreign bodies, such as wool and hairs in the meatus. Inflammation, calcareous degeneration, and destruction or extreme relaxation of the membrana tympani. All these causes are readily observed, and the treatment is obvious. The following causes are more obscure:—inflammatory thickening of the Eustachian tube at its faucial orifice; also at its tympanic orifice; collections of pus, mucus, or blood in the tympanum; anchylosis of the ossicula. Diseases affecting the auditory nerve generally implicate the portio dura, and facial palsy of one side results.

Functional deafness may result from concussion, sudden and loud noises, poisons, *e.g.* aconite, typhus fever, diphtheria.

CHAPTER VIII.

CUTANEOUS DISEASES.

CLASSES.

1. PARASITICAL. 2. NON-PARASITICAL.

PARASITICAL.

Orders.

1. DERMATOZOA	Animal Parasites.
2. DERMATOPHYTA	Vegetable Parasites.

NON-PARASITICAL.

Orders.

1. EXANTHEMATA	Rashes.
2. VESICULÆ	Vesicles.
3. BULLÆ	Blebs.
4. PUSTULÆ	Pustules.
5. PAPULÆ	Pimples.
6. SQUAMÆ	Scales.
7. TUBERCULÆ	Tubercles.
8. MACULÆ	Spots.

GENERAL OBSERVATIONS ON CUTANEOUS DISEASES.

In order to take a just and comprehensive view of diseases of the skin, the complexity of its structure and function must be duly considered. It forms a most extensive vascular and exhalent surface, the nature and functions of which bring it into direct reciprocal relation both with the lungs and the kidneys. It has a proper glandular apparatus—the sebaceous. It contains the organ of touch, and is the seat of common sensation. It is furnished with hairs and nails, which share every derangement of the part of the skin to which they are attached, and of which they are but modified processes. A surface so richly supplied with blood-vessels, nerves, and glands, must necessarily be very liable to derangement from variations of such external influences as temperature and moisture; and while its vascular surface sympathises with every derangement of the circulation in the internal organs, its protective cellular covering, and glandular orifices, are exposed to the invasions of parasites.

At present the classification of cutaneous affections is extremely imperfect, but as our knowledge of them increases we shall be able to form a simpler and more rational classification. In this work something has been done towards the attainment of this object by making the diseases due to parasites a separate class, subdivided into two orders.

The subdivision adopted for the other orders is convenient; but it must be borne in mind that there are no abrupt lines of demarcation between them. An exanthem may pass through the successive stages of papule, vesicle, pustule, and squama in the natural sequence of morbid action and without any new exciting cause.

Two diseases must be placed by themselves, as not admitting of classification;—lupus, furuncle.

DEFINITIONS.

1. *Exanthemata. Rashes.*—Superficial red patches, variously shaped, circumscribed, or diffused, disappearing on pressure, and terminating by resolution, deletescence, or desquamation.

2. *Vesiculæ. Vesicles.*—Small, round, pointed elevations of the cuticle, containing a colourless, transparent, or opaque, pearly lymph. They break and discharge their contents, and are succeeded by scurf, scales, or sores. Sometimes their contents are absorbed.

3. *Bullæ. Blebs.*—Vesicles of larger size.

4. *Pustulæ. Pustules.*—Circumscribed elevations of the cuticle, containing pus, and terminating in thick crusts or scabs.

5. *Papulæ. Pimples.*—Small, firm, pointed elevations of the skin, usually terminating in scurf; rarely by ulceration of the summit.

6. *Squamæ. Scales.*—Hard, opaque layers of cuticle, covering papulæ or inflamed surfaces; continually detached and renewed.

7. *Tuberculæ. Tubercles.*—Small, hard, persistent tumours of the skin, larger than papulæ, with or without an inflamed base, and terminating in resolution, partial suppuration, or ulceration.

8. *Maculæ. Spots.*—Permanent discolorations, or decolorations, of the skin, often accompanied by change of structure.

PARASITICAL SKIN DISEASES.

ORDER I.

DERMATOZOA—ANIMAL PARASITES.

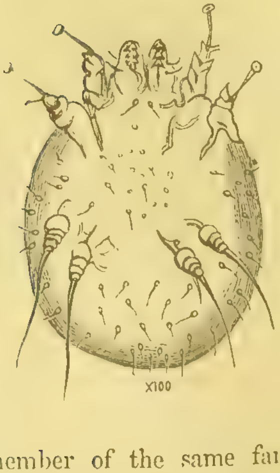
ACARUS SCABIEI . . .	The Itch.
ACARUS FOLLICULORUM.	
PHTHYRIASIS	Lousiness.
FILARIA MEDINENSIS . .	Guinea Worm.

SCABIES. PSORA—THE ITCH.

SYMPTOMS.—The usual seat of this eruption is between the fingers, on the wrists, inside of the forearm, and at the bends of the joints; but it may affect any part of the body. It generally makes its appearance a few days after exposure to the contagion, and is preceded for one or two days by itching, increased towards evening and at night, and by all causes which excite the circulation. The eruption consists either of pale rose-coloured or greyish pimples, or of pointed vesicles, containing serum, raised slightly above the surface. In severe cases these vesicles enlarge, and become filled with pus (Scabies purulenta), or they are destroyed by friction, and leave small round dark spots. The pimples or vesicles are either single or in small groups; rarely in patches of any size. The disease is accompanied throughout by most distressing itching.

CAUSES.—*Predisposing.* Neglect of personal cleanliness.—*Exciting.* Contagion; the *acarus* (Sarcoptes, Cheyletes) *scabiei.* (Fig. 85.) Half an hour after it is placed on the skin it bores perpendicularly through the cuticle, and then obliquely through the softer cells beneath to the cutis, in a little circular depression of which it lodges itself.

Fig. 85.



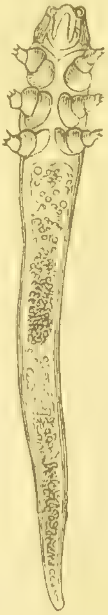
DIAGNOSIS.—The vesicular and pustular forms of scabies are distinguished by a little black line which can usually be traced from the centre of the itch vesicle outwards for a short distance. This is the tunnel formed by the acarus. When scabies assumes the papular form, and the summits of the pimples are scratched off, so as to leave round dark spots, it is difficult to distinguish from *Prurigo senilis.* Advanced age affords a probability in favour of the latter; while the fact of more than one member of the same family being affected, is conclusive as to the former. From *lichen,* by the latter being papular, more clustered, and, if situated on the hand, being on the back, and not between the fingers. From *herpes* and *eczema*, by the vesicles being more isolated, and in smaller clusters, by the intense itching and by their contagious nature, and often by their situation. Scabies very rarely attacks the face.

Treatment.—Sulphur ointment, or an ointment of sulphur and carbonate of potash; sulphur baths; sulphuret of lime, with olive oil; a strong alcoholic solution of stavesacre. Cleanliness and the warm bath, and gentle aperients if required, are useful auxiliaries.

ACARUS FOLLICULORUM.

Synonym.—Demodex folliculorum. Steazoon folliculorum.

Fig. 86.



This parasite (Fig. 86) was discovered by Henle and Gustave Simon in 1842. Some observers state that it may be found in the sebaceous follicles of most persons. They occur sometimes singly, sometimes as many as thirteen in a follicle; they usually occupy the duct near the orifice, towards which the abdomen is directed, the head lying deeper in the gland.

According to Mr. Erasmus Wilson the animal varies in length from the $\frac{1}{135}$ to the $\frac{1}{64}$ of an inch. Much difference exists in the length and development of the abdomen. As represented in Fig. 86 it is much elongated. In the other varieties there are four pairs of legs, and the abdomen is shorter.

Symptoms.—This parasite usually causes no disturbance, and appears to be compatible with a perfectly healthy state of the sebaceous follicles; sometimes, however, it produces pustular and indurated acne of rather an inveterate form.

Treatment.—The follicles should be emptied by pressure, and unguentum sulphuris, or a solution of sulphur and camphor in spirit of turpentine, rubbed in.

PHTHYRIASIS—LOUSINESS.

Three species of louse take up their abode on the human body. They are the following:—Pediculus capitis, P. corporis, and P. pubis.

Symptoms.—They run about and bite the skin, producing intolerable itching, and occasionally pustular eruptions; their eggs (popularly called *nits*) are readily observed attached to the hairs.

Treatment.—Mercurial ointment, well rubbed in, is an effectual remedy against the *P. pubis*. The unguentum hydrargyri ammoniati is equally efficacious against the other two species.

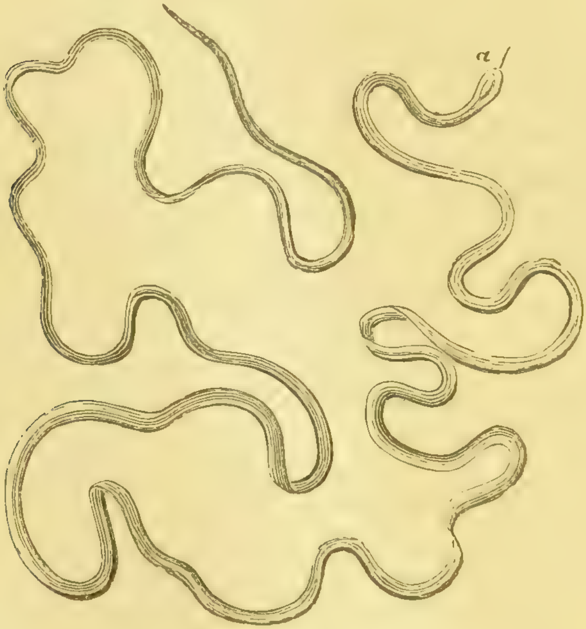
FILARIA MEDINENSIS—GUINEA-WORM.

SYNONYMS.—Dracunculus. Hair-worm.

SYMPTOMS.—An itching is felt in the skin of some part of the arms or legs; most frequently in the lower extremities, and especially in the feet. This is soon followed by a small vesicle, succeeded by an indolent inflamed swelling like a boil, which breaks and discharges. The head of the worm gradually protrudes through the opening, so as to be easily seized; but unskilful attempts to withdraw it are apt to be followed by acute inflammation, extensive suppuration, and, in some cases, mortification.

DIAGNOSIS.—The length of the worm varies from half a foot to twelve feet. Its form and size are shown in the subjoined engraving (Fig. 87) of a worm extracted from the heel of a negro, and preserved in the Museum at King's College. The form of the tail is seen at *a*. The head is of a darker colour than the body.

Fig. 87.



CAUSES.—*Predisposing*. The rainy seasons in the tropical regions of Asia, Africa, and especially Upper Egypt, Nubia, and Guinea.—*Exciting*. The worm in an embryo state pierces the skin (usually the feet and hands), immersed in, or otherwise brought into contact with the water which it inhabits.

Treatment.—The worm must be cautiously and patiently extracted, by rolling a fresh portion each day round a quill or roll of cotton, strapped in the intervals to the adjoining skin. Suppuration should be promoted by bread poultices.

Prophylaxis.—When the disease prevails among bodies of men, separation from the sound, and scrupulous cleanliness.

Order II.

VEGETABLE PARASITES.

*Epidermmycosis Versicolor .	Chloasma.
Epidermmycosis Decalvans .	Baldness.
Epidermmycosis Tonsurans .	Ringworm of the Scalp.
Dermmycosis Circinata . .	Ringworm.
Dermmycosis Sycosa . . .	Chin Welk.
Dermmycosis Favosa . . .	Scall Head.
Plica Polonica.	
Fungus Foot of India.	

EPIDERMMYCOSIS—MOULDINESS OF THE EPIDERMIS, AND DERMMYCOSIS—MOULDINESS OF THE SKIN.

Under these generic terms are included all diseases of the skin and its appendages, which are known to be due to vegetable parasites.

The confusion in the nomenclature of skin diseases is so complete, that an apology for employing new terms which are at once significant and descriptive is scarcely needed. In applying these new terms, we shall associate them with the names in common use, in order that the diseases to which these refer may be the more readily recognised.

EPIDERMMYCOSIS VERSICOLOR.

Synonyms.—Pityriasis versicolor, et rubra. Chloasma, Pannus hepaticus. Liver spots.

Symptoms.—Delicate pinkish, greyish, or light yellowish-brown spots, varying in diameter from the $\frac{1}{8}$th of an inch to an inch or more, in the axillary, pubic, and inguinal regions, gradually extending and becoming confluent, so as to form continuous patches with sinuous margins, covering the greater part of the chest, abdomen, and shoulders, leaving here and there a small island of healthy skin. Its favourite seat is under the hairs about the pubes. It never affects parts exposed to the light. The colour varies much: in most persons of dark com-

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* See Glossary.

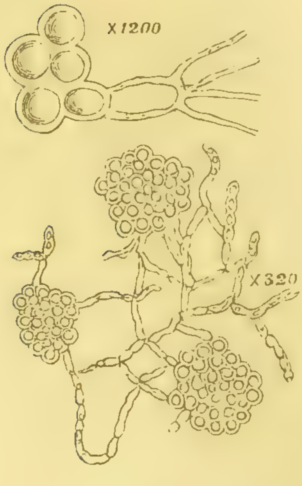
plexions, it has a light dirty-brown colour, and is separated from the surrounding healthy skin by a sharply-defined line; in others the colour is fainter, and resembles that of a sunburnt face. Occasionally only a few small circles of skin are unaffected, forming, perhaps, a single cluster, not larger than the hand, on some part of the trunk. The hue of the diseased skin corresponds so closely to that of the exposed parts of the body that I have known the few pearl-like spots of healthy skin to be mistaken, under the name of *albinism*, for the diseased skin.

Usually there is no breach of surface, and the disease is apparently nothing more than a spreading discoloration; but on examining the discoloured skin attentively, the cuticle is observed to be minutely wrinkled, and on scraping it with a scalpel we find that the discoloured portions may be separated as minute silvery scales, whereas the healthy cuticle is not readily detached.

The disease being entirely confined to the epidermis, is unaccompanied by irritation; so that in some cases, when the patient's attention is first called to it, he doubts whether or not the discoloration is congenital. When the disease is of long standing, the cuticle becomes loose, and a minute silvery desquamation takes place continuously.

CAUSE.—A fungus, called Mycrosporon furfur, composed of minute pointed filaments forming a close network among the cells of the cuticle, and developing vast numbers of bright spherical, nearly equal-sized spores, in patches of various sizes. (Fig. 88.)

Fig. 88.



CONTAGION.—The fungus may be easily transplanted to the healthy skin by lying between sheets previously used by one affected with the disease. The fungus never attacks persons before the age of puberty. According to my own observations it is more frequently found in men than in women, and in those who lead a dissolute life. Robust health and cleanliness confer no protection whatever. The gentleman from whom the specimen delineated in Fig. 88 was obtained, was of the most scrupulously cleanly habits; yet the disease spread unchecked for two years. Indeed daily baths appear to facilitate its development.

DIAGNOSIS.—The characteristic appearance under the microscope. The cuticle should be scraped off with a scalpel, placed on a glass slide, and wetted with weak solution of ammonia, which renders the cuticular cells transparent. So minute is the fungus, that a $\frac{1}{6}$ object-glass, at least, is necessary. Epidermmycosis versicolor is frequently mistaken for syphilitic eruptions, and the patient subjected to treatment accordingly.

Treatment.—Solution of chloride of mercury (gr. i–iii to f℥j); or hyposulphite of soda (gr. xxx to f℥j); or sulphurous acid daily applied to the skin. The disease rapidly yields, and the skin resumes its healthy colour under this treatment.

EPIDERMMYCOSIS DECALVANS.

Synonyms.—Porrigo decalvans. Alopecia. Phyto-alopecia.

Definition.—Mouldiness of the roots of the hair, resulting in baldness.

Symptoms.—The hair becomes dry, withered, and faded; falls off, and is not regenerated, leaving more or less circular patches of smooth, apparently healthy skin. The disease may spread over the whole surface, and entirely deprive the body of hair.

Cause and Pathology.—The development of the fungus Microsporon Audouini in the roots of the hair, within the follicles, and for a little distance beyond. The plant is composed of minute round and oval spores, and short branched filaments. It forms a uniform layer round the roots of the hair, and invades the cuticle and cortex, rendering the hair opaque and brittle. The plant develops very rapidly.

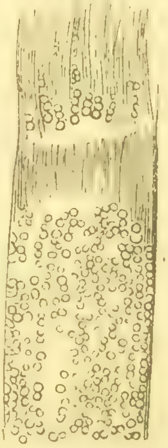
Contagion.—The disease is readily communicated by the spores of the fungus.

Treatment.—That recommended for Epidermmycosis versicolor.

EPIDERMMYCOSIS TONSURANS—RINGWORM OF THE SCALP.

Synonyms.—Porrigo scutulata. Herpes tondens. Trichosis furfurans. Rhizo-phyto-alopecia.

Fig. 89.



Definition.—Mouldiness of the roots of the hairs of the head, resulting in their breaking away nearly on a level with the surface of the skin.

Symptoms.—The hairs are thickened, bent at their junction with the skin, have a withered appearance, become very brittle at the roots, and ultimately break off at a distance of one or two lines from the surface. The stumps present a ragged, split appearance, and readily break if an attempt be made to remove them from the follicle. The disease affects the hair in dry, scaly, circular patches, varying from half an inch to four inches in diameter. The contiguous cuticle sharing in the disease, and forming characteristic scaly fringes round the orifices of the hair follicles. Vesicles and dry scabs are occasionally formed during the progress of the disease.

Cause and Pathology.—The roots of the hairs are found to b completely pervaded and split up by the Tricophyton tonsuran (Fig. 89), a fungus composed of minute round or oval spores, destitut of granules, and short curved filaments.

Contagion.—The disease is readily communicated by the spores.

Treatment.—That recommended for Epidermmycosis versicolor.

DERMMYCOSIS CIRCINATA—RINGWORM.

Synonyms.—Tinea circinata. Herpes circinatus.

Definition.—Mouldiness of the skin, chiefly of the epidermis, spreading in the form of rings.

Symptoms.—At first a number of very small vesicles arranged in circles on a red, inflamed base. The breadth of the ring formed by the vesicles is usually about a quarter of an inch; the base itself varying from a few lines to one or two inches. The vesicles crack, and the secretion dries and forms scales which are readily detached. External to these scales a fresh ring of vesicles is developed, which also become converted into scales, and thus the process goes on, the patch constantly widening by centrifugal growth, and leaving the parts previously affected in a chronically inflamed and dry scaly condition. The disease chiefly attacks the young, and usually appears on the face, neck, chest, and arms. When it affects the scalp it takes on the same form and produces the same effect as Epidermmycosis tonsurans, with which it is probably identical. The disease is highly contagious.

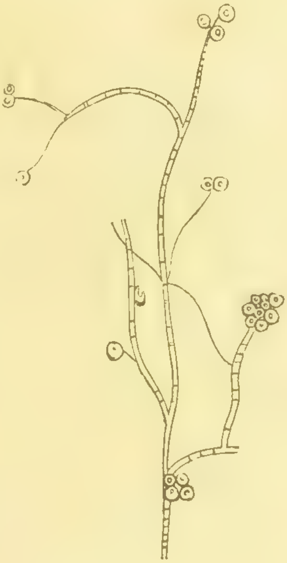
The *cause*, *mode of propagation*, and *treatment*, are those described under Epidermmycosis tonsurans.

DERMMYCOSIS SYCOSA.

Synonyms.—Mentagra. Tinea sycosa. Sycosis menti. Mentagrophyte. Chin Welk.

Symptoms.—Redness, tension and smarting of the skin of the chin, lower jaw, or upper lip, followed by an eruption of small red points, which, in a day or two, ripen into distinct pointed pustules, traversed by a single hair. After five or six days more, the pustules discharge their contents, and form thin brownish scabs, which fall off, and are sometimes not renewed, the disease terminating in from ten days to a fortnight; but usually successive crops are developed, and in extreme cases, the skin is covered with a thick, yellowish-brown crust, in which the hairs are matted. When the disease has continued some time the beard falls off. In chronic cases, the skin of the parts affected is covered with tubercles. The disease may attack any part where the hairs are strong. It is often very obstinate.

Fig. 90.



CAUSE AND PATHOLOGY.—The disease is due to the development of the Microsporon mentagrophytes (Fig. 90), which invades the hair follicles and forms a sheath round the roots of the hairs. The fungus luxuriates in the epithelial layer of the hair follicle, and sets up inflammation in the subjacent vascular parts.

DIAGNOSIS.—The spores are very minute, and the filaments branch at acute angles and are annulated.

TREATMENT.—The hair should be removed from the affected follicles by pincers and a solution of corrosive sublimate (gr. x to f℥j) should be applied with a camel hair brush. Epilation is usually easy and painless, for the tendency of the disease is to loosen the hair.

DERMMYCOSIS FAVOSA.

SYNONYMS.—Favus. Tinea favosa, annularis, et rugosa. Porrigo lupinosa, et scutulata. Scall head. Honeycomb scall.

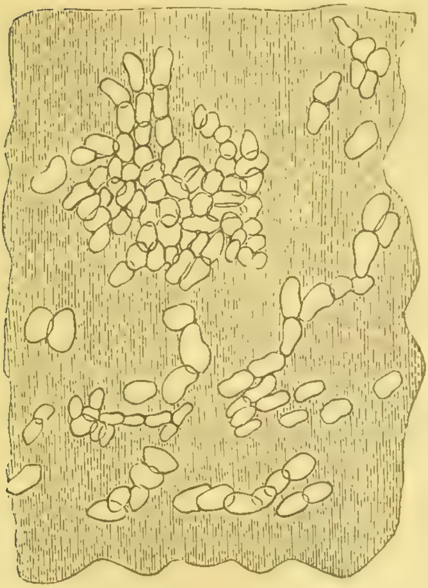
VARIETIES.—Porrigo favosa; porrigo scutulata; porrigo decalvans.

SYMPTOMS.—Small round pustules, usually seated on the hairy scalp, and containing a yellow matter, which hardens into a prominent scab with a central depression (*favus*). The disease generally attacks children, but is not confined to them. The primary seat of the disease is in the hair follicles.

It is not confined to the scalp, but may attack the chin, eyebrows, or forehead, and, in rare instances, the trunk or extremities. The scabs have an offensive mousy odour. When the pustules are closely set, the yellow crusts become confluent, and present a honeycombed appearance. If few pustules only appear, and their development be not interfered with, the favi become greatly enlarged, sometimes to the diameter of 1½ inch; and form circular, yellow, dry elevations, depressed in the centre, and with smooth, rounded, varnished margins. These large crusts may become confluent, and then form the variety known as *Porrigo lupinosa*. When the disease is of some duration, it may be seen at the same time in all its stages—the red patches, the cluster of yellow pustules, crusts of various thickness, and bald spots. If the scabs be removed by poultices, the favi are reproduced on the clean raw surface. When the disease disappears, the hair is slowly reproduced, but sometimes there is permanent baldness. The nails are occasionally affected.

CAUSES AND PATHOLOGY.—The disease is due to the development of the Anchorion Schönleinii (Fig. 91), in the deeper layers of the epidermis, and on the surface of the cutis. At first the deeper epithelial cells are disturbed, and the cuticle, and subsequently the whole epidermis, becomes raised, in a circular, yellowish-white spot, which increases in size, assumes a sulphur yellow colour, and becomes a favus. When, as is commonly the case, the parasite attacks the hair follicles, the depressed centre of each favus is occupied by a hair, which becomes thickened, opaque, non-elastic, and may readily be removed. When the crusts are removed, soaked in ammonia, and examined, they are found to be chiefly composed of the spores and large-jointed spore containing filaments of the fungus.

Fig. 91.



DIAGNOSIS.—The presence of the fungus distinguishes the disease from eczema and impetigo; and the scabs of eczema have never the characteristic alveolar depressions. The pustules of impetigo are prominent and convex, seated on an inflamed base, and the purulent contents have no trace of fungi.

PROGNOSIS.—The disease is often obstinate and of long duration.

TREATMENT.—The hair must be cut close with sharp scissors, and well washed, and the scabs must be softened with warm fomentations or poultices. The best local application is the iodide of sulphur ointment; or a saturated solution of sulphurous acid may be used.

PLICA POLONICA.

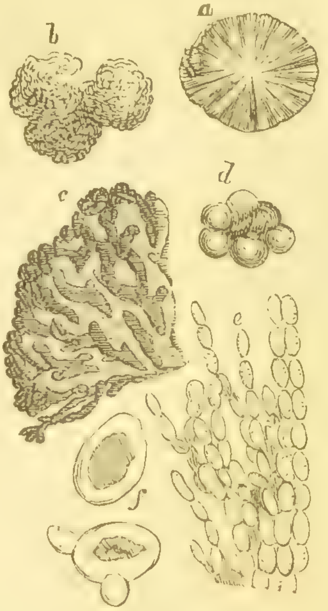
A disease of the hair allied to the present class, but almost unknown in this country. It consists in an inflamed and tender state of the scalp, and a swollen condition of the hairs which are glued together into a compact mass by a viscid and offensive secretion. Two parasitic plants —the Tricophyton tonsurans and Tricophyton sporuloides—are said to accompany it, and are thought to be the cause of it. Nothing is known of the proper treatment, but the disease seems to be aggravated by cutting the hair. The best chance of cure would seem to be afforded by the application in the form of vapour of such stimulants as the mixed vapour of iodine and sulphur.

FUNGUS FOOT OF INDIA.

SYNONYMS.—Madura foot. Podelkoma. Mycetoma. Ghootloo. Mahdeo. Kirudeo. Dr. H. V. Carter, of Bombay, has given a full description of this disease, and an elucidation of its cause, in the Trans. of the Medical and Physical Society of Bombay, 1860. The following is a brief summary of the principal facts:—

SYMPTOMS AND PATHOLOGY.—The disease appears as a flattened swelling of the integument, from which the cuticle is thrown off, leaving a white surface, which presents numerous pinkish spots, and on making sections of the cutis these are found to be the extremities of pink, red, or orange-brown streaks radiating through the corium. This deposit is composed of minute bright globules, measuring $\frac{1}{4000}$ to $\frac{1}{6000}$ of an inch in diameter. Occasionally, spherical groups of spores are seen. After a time the whole foot becomes swollen, and greyish depressed spots appear, composed of a thin layer of cuticle, which finally ruptures and discloses the orifice of channels, allowing the passage of a probe for a greater or less distance. Numerous depressions and circular apertures form over the surface of the dorsum, sides, and heel of the foot; they are large enough to admit a pea or a shot, and numbers of small round granules like fish-roe or poppy-seeds are discharged with an ichorous offensive fluid from the orifices. The foot continues to enlarge, and becomes much misshapen. The surface is riddled with numerous round holes of various sizes, leading to canals and cavities which pervade all the textures of the foot, including the bones. The lower ends of the tibia and fibula are often excavated into numerous communicating cavities, some large enough to lodge a hazel nut. The sinuses and excavations are filled with mahogany-brown or pink granules. A section of the diseased foot presents great indistinctness of

Fig. 92.*



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* *b.* A globular mass of the fungus, natural size. *a.* Another in section. *c.* A fourth part of *a* slightly magnified. *d.* Spherical granules from outer surface of *b* magnified; *e* and *f*, beaded filaments and spores highly magnified.

parts, the tissues being everywhere excavated, changed, and in places infiltrated with the coloured granules. The disease attains its maximum development in about four years. It may continue for twelve years. No acute pain attends its progress, but merely a deep-seated aching. The health suffers considerably, and the patient becomes emaciated and weak.

In one case the disease has been observed to attack the hand.

CAUSE.—The development of a fungus, called by Mr. Berkeley, Chionyphe Carteri. It occurs in globular masses, varying in size from a pin's head to that of a bullet (*a b c*, Fig. 92), friable and black upon the surface, where they present numbers of minute tubercles (*d*). Sections show a radiated arrangement (*a*). Minutely examined, they are found to be composed of radiating tubular fibres, which branch and unite towards the circumference (*c*). Near the surface they become beaded (*e*). Interspersed among these fibres are the spores (*f*). Dr. Carter believes that the fungus is introduced from without, the spores gaining admission through the orifices of the sweat ducts, or any slight abrasion of the surface. The disease has occasionally followed a prick from a thorn. Farm labourers between the ages of 17 and 50, who go about with their feet uncovered, are most liable to its attacks.

DISTRIBUTION.—The disease is endemic in the Bombay and Bengal Presidencies. "Kattiawar, Kutch, Gujerat, Sind, the Deccan, Lower Concan, are known localities in the former Presidency. Aden appears doubtful. On the Madras side, Guntoor, Bellary, Madura, and Cuddapah are well-known localities; parts of Mysore, and, it is said, Trichinopoly." (Carter.) In the Bengal Presidency it appears to prevail around Sirsa, and patients come from Bicaneer, Bhawalpore, and Hissar.

TREATMENT.—In the later stages, amputation of the foot is the only remedy. In the earlier ones, the application of a strong solution of corrosive sublimate or hyposulphite of soda.

NON-PARASITICAL SKIN DISEASES.

ORDER I.

EXANTHEMATA—RASHES.

RUBEOLA . . .	Measles (p. 316).
SCARLATINA . .	Scarlet Fever (p. 319).
ERYSIPELAS . .	St. Anthony's Fire (p. 273).
ERYTHEMA . .	Inflammatory Blush.
URTICARIA . .	Nettle-rash.
ROSEOLA . . .	Rose-rash.

ERYTHEMA—INFLAMMATORY BLUSH.

SYMPTOMS.—Red patches of variable form and extent disappearing on pressure, with little or no swelling, heat, pain, or fever. Not contagious, nor attended with danger.

VARIETIES.—1. *Erythema papulatum*, occurring in young persons of both sexes, on the trunk and upper extremities, in small, round, and slightly-prominent patches, which disappear entirely in the course of a few days.—2. *Erythema tuberculatum*, in which the patches are larger, more prominent, and more permanent.—3. *Erythema nodosum*, which occurs chiefly in children and young persons of both sexes, on the extremities, especially the forepart of the leg, its form rounded or oval, its size varying from half an inch to an inch in diameter, at first slightly raised above the surface, but in a few days assuming the form of red, painful tumours. The tumours disappear in from a week to a fortnight. It is generally preceded by debility.—4. *Erythema centrifugum*, appearing mostly on the cheek, as small round raised patches, which gradually spread from a small pimple till they cover a considerable extent of surface.

TERMINATIONS.—In resolution without desquamation, or with slight desquamation (E. fugax and E. læve); or in a sero-purulent exsudation of a disagreeable odour (E. intertrigo).

CAUSES.—Friction and pressure; heat and cold; acrid discharges, as those of coryza, leucorrhœa, or gonorrhœa, and the urine and fæces; dentition; dyspepsia; tension of the skin, as in anasarca.

DIAGNOSIS.—From *erysipelas*, by the redness being lighter and more superficial, and the swelling less; by the absence of heat and pain; and by its milder character and more favourable termination. From *roseola*, by the peculiar rosy tint of the latter. From *rubeola* and *scarlatina*, by the semi-lunar patches of the first, and by the great extent and deep-red hue of the last. Also by the peculiar constitutional symptoms and contagious character of these diseases.

Prognosis.—Favourable.

Treatment.—When idiopathic, these blotches disappear of themselves, or yield to gentle aperients, the warm bath, and tonics. If symptomatic, the treatment is that of the primary disease.

In Erythyma nodosum the menstrual function is usually disordered, and chalybeate tonics are required.

URTICARIA—NETTLE-RASH.

Varieties.—1. Urticaria evanida. 2. Urticaria febrilis.

1. URTICARIA EVANIDA.

Symptoms.—An eruption resembling in appearance, and in the intolerable itching which attends it, the stinging of nettles. The spots often appear suddenly, especially if the skin be rubbed or scratched, and seldom last many hours, sometimes not many minutes, but vanish, to appear on another part. Sometimes the rash assumes the form of long wheals, as if the part had been struck with a whip or cane. The swellings are always firm and solid, and contain no liquid. In some persons, the eruption lasts only a few days, in others many months or years, appearing and disappearing at intervals. The rash generally disappears in the daytime, to return in the evening, and is accompanied by slight feverishness. It terminates in desquamation.

Causes.—*Predisposing.* Peculiar constitution.—*Exciting.* Handling the leaves of the common nettle. Shell-fish; mushrooms; honey; vinegar; cucumbers; salad. Strawberries and several other fruits and articles of diet will cause urticaria in certain persons; also valerian, turpentine, and copaiba.

Diagnosis.—By its close resemblance to the sting of the nettle, the itching that attends it, and its fugitive character.

Prognosis.—It generally disappears under the use of simple remedies; but may last for months or years.

Treatment.—If caused by irritating food, an emetic, followed by a gentle aperient. In chronic cases, warm or vapour, alkaline or sulphur, baths; with a strictly-regulated diet, aperients, and alteratives. In obstinate cases, Fowler's solution (five or six drops three times a day). The smarting may be allayed by lotions of acetate of lead, or cyanide of potassium, or by the warm bath.

2. URTICARIA FEBRILIS.

Symptoms.—This is generally caused by some article of food which has disagreed with the patient. There is more or less fever or constitutional disturbance, followed by heat and tingling of the body; and then by an eruption, beginning on the shoulders, loins, and inner surface of the arms and thighs, and round the knees, consisting of irregularly-shaped pale blotches, surrounded by a deep-red border, but soon assuming a uniform deep-red colour, and attended by intense itching. The blotches appear and disappear several times, and gradually subside in a few days or a week. There is generally an increase of itching and smarting towards evening. The *treatment* is that of Urticaria evanida, but more active. After an emetic of ipecacuanha, a saline aperient (Form. 261).

ROSEOLA—ROSE-RASH.

SYMPTOMS.—Slight febrile symptoms, succeeded by deep-red patches of various size and form, appearing on different parts of the body, and generally disappearing in one or two days, or a week.

VARIETIES.—1. *Roseola infantilis.* An eruption of numerous small, distinct, circular patches, of a deep rose-red colour, occurring in infants from dentition or intestinal irritation.—2. *Roseola æstiva.* This form is most common in children and females. It is preceded by feverishness. The rash, which is of a deep-red colour, and attended with itching and pain, and sometimes with an inflamed throat, with some difficulty in swallowing, commonly appears between the third and seventh days on the face and neck, whence it rapidly spreads over the rest of the body. It lasts about three or four days, and then disappears.—3. *Roseola autumnalis* is a less severe affection, occurring also chiefly in children, and presenting larger patches, seated mostly on the upper extremities. —4. *Roseola annulata*, appearing, as the name implies, in rosy rings, enclosing a portion of healthy skin, and gradually spreading. The rash is most common on the belly, loins, buttocks, and thighs. It may be acute or chronic, and is generally dependent upon some disorder of the alimentary canal.

CAUSES.—Teething; irritation of the stomach and bowels; drinking cold water when the body is heated; severe exercise. The disease is sometimes epidemic; it occasionally precedes the eruption of the small-pox, occasioning some difficulty in diagnosis.

DIAGNOSIS.—From measles and scarlet fever, by the mildness of the constitutional symptoms, and the absence of the catarrhal symptoms of the one, and the sore throat of the other.

PROGNOSIS.—A favourable termination in a few days or a week.

TREATMENT.—Saline aperients with small doses of tartar-emetic two or three times a day; and an occasional warm bath.

ORDER II.

VESICULÆ—VESICLES.

VARICELLA	Chicken-pox (p. 315).
ECZEMA	Running Scall.
HERPES	Tetter.
MILIARIA	Miliary Fever.

ECZEMA—HUMID TETTER.

SYNONYMS.—Running scall; crusta lactea.

SPECIES.—1. Acute. 2. Chronic.

1. ACUTE ECZEMA.

SYMPTOMS.—An eruption of small slightly-raised vesicles, crowded together on broad irregular patches of bright-red skin, accompanied by severe tingling and smarting. The fluid in the vesicles soon becomes opaque and turbid, and, in four or five days, is discharged, and dries into thin yellowish-green scabs. Fresh vesicles form on the surrounding skin, while the parts already affected are kept moist by constant exudation. When the eruption is of some standing, the skin presents a highly-inflamed surface, studded with a large number of minute pores, covered with thin white membranes. Usual duration, from a week to a month.

VARIETIES.—1. *Eczema simplex.* A mild form, free from constitutional disturbance, mostly attacking women and young children on the arm and forearm, and between the fingers, generally terminating in resolution.—2. *Eczema rubrum.* The skin is inflamed, hot, and tense, of a bright-red colour, and covered with small vesicles surrounded by an inflamed areola. The rash generally terminates in about a week, with slight exfoliation of the cuticle; but in more severe cases, the inflammation increases, the vesicles coalesce, the contained serum becomes opaque, and at length escapes as an irritating fluid, which forms loose thin incrustations, and these falling off, display a highly-inflamed surface. The disease either disappears in two or three weeks, the healing process beginning at the margins, or it becomes chronic.—3. *Eczema impetiginodes.* In this form, the inflammation, which is still more acute and rapid in its progress, is accompanied by much swelling and tension, and some fever; and the contents of the vesicles becoming purulent dry into soft yellow scabs, which fall off, and are reproduced, displaying a red inflamed surface covered with an ichorous serum. It generally terminates in about a month, the skin gradually assuming a more healthy appearance; or it runs into the chronic form. It is distinguished from impetigo by being at first vesicular, whereas impetigo is a pustular disease from the beginning; and by the thinner scabs.

CAUSES.—*Predisposing.* The female sex; the seasons of spring and autumn.—*Exciting.* Intense heat; the irritation of blisters frictions with mercury (*eczema mercuriale*); the handling of dry powders, flour, metals, &c. Contagion (?)

Diagnosis.—An abundance of watery vesicles with tenderness and smarting distinguish eczema from scabies. *Miliaria* is accompanied by fever and profuse perspiration. *Lichen* is papular. *Psoriasis* is dry and scaly.

Prognosis.—*Favourable*, but often difficult of cure.

Treatment.—The mineral acids internally administered, cooling drinks, simple diet, warm baths, water-dressing, local baths of linseed, marsh-mallow or bran, or poultices of potato-flour. The distressing tingling and smarting may be relieved by decoction of poppy-heads, or by a lotion consisting of two grains of cyanide of potassium, to an ounce of water. Alkaline lotions, and zinc or chalk applications, are often of much service.

CHRONIC ECZEMA.

Symptoms.—This is a sequel of the acute form, and often intractable. The skin, from the continued abundant discharge of acrid serum and the reproduction of the vesicles, is highly inflamed and marked by fissures at the joints. Sometimes there is but little moisture, and the surface is cracked and covered with shining crusts, beneath which the skin is of a bright-red colour. The disease often spreads from a small point over a considerable extent of surface, and is accompanied by intense itching and smarting, which is particularly distressing when the eruption occupies the inner surface of the thighs, the verge of the anus, or the vulva. When it attacks the face, the conjunctiva of the eye is involved, and there is much smarting, with some intolerance of light. The eruption often lasts for years, being heightened and renewed in spring and autumn; and sometimes, after the resources of art and the patience of the sufferer are exhausted, rapidly disappears.

Causes.—*Predisposing*. Obscure.—*Exciting*. Intestinal irritation; painful dentition; dysmenorrhœa.

Treatment.—Mineral acids administered internally and with one of the bitter infusions, alkaline lotions externally. An alterative aperient should be given at bed-time occasionally. In obstinate cases ♏iii to ♏v of liquor arsenicalis may be prescribed. The sulphur bath (Form. 335) may be used with advantage. The itching and smarting are best allayed by the zinc ointment mixed with spirits of wine (ung. zinci ℥i, spt. vin. rect. ʒi) smeared over the surface, and renewed once or twice a day; or by simple cold-water dressing. A handkerchief, moistened with a teaspoonful of chloroform, placed near the seat of irritation, and covered with the bed clothes, often allays the smarting. A solution of nitrate of silver (ten grains to the ounce) will also sometimes afford great relief. (G.)

HERPES—TETTER.

Symptoms.—The rash begins as circumscribed groups of distinct vesicles on an inflamed base; but these soon coalesce, and their contents, which were at first watery, become yellowish-white or yellow, escape and form a scab. This soon falls off, leaving an inflamed surface, which rapidly heals. The eruption is commonly preceded by slight constitutional symptoms, and sometimes by acute darting pain, which, when the eruption has made its appearance, changes to heat and smarting. The disease is rarely attended with danger, and generally lasts about a week or ten days.

Varieties.—1. *Herpes phlyctenodes*, that which has no particular seat.—2. *Herpes labialis*, that which affects the lips. It may extend to the nose, cheeks, and chin; it also attacks the mucous membrane of the lips and mouth. It is a very common accompaniment of catarrh, and of inflammatory affections of the mucous membrane of the mouth, throat, and stomach; and it often appears during an attack of pneumonia and ague, and concludes an attack of relapsing fever.—3. *Herpes preputialis* attacks the internal or external surface of the prepuce, and is preceded and accompanied by itching and smarting. It is easily distinguished from syphilis when recent, and afterwards by its history. The sore remaining after the vesicles have burst is superficial, and readily heals if the two surfaces of the prepuce be separated with lint. —4. *Herpes zoster, zona, or the shingles*, is very characteristic in its appearance, position, and course. As the name implies, it surrounds the body like a zone or girdle, beginning somewhere about the mesial line, and travelling round one-half of the body, following the direction of the intercostal nerves, below the nipple, at the lower part of the back and groin, or at the upper part of the thigh. It is often preceded for several days, or even longer, by very acute darting pains. It runs a mild course, and disappears in two or three weeks.—5. *Herpes iris.* A very rare variety, consisting of four rings of different shades of colour.

Causes.—*Predisposing.* An east wind.—*Exciting.* Catarrh; inflammation of the mucous membranes; indigestion.

Diagnosis.—From *pemphigus*, by the smaller size and greater number of the vesicles. From *eczema*, by the larger size of the vesicles, the raised inflammatory base, and, generally, by the smaller size of the patches.

Prognosis.—*Favourable.* The disease lasts from a week or ten days to a month, and in rare cases longer.

Treatment.—Gentle aperients with antimonials, a regulated diet, and local applications of warm mucilaginous liquids. The constitutional treatment must be determined by the age and state of system.

MILIARIA—MILIARY FEVER.

SYMPTOMS.—This disease sets in with rigors, extreme debility, depression of spirits, and a sense of tightness and oppression about the præcordia, with shortness of breath, and, in some instances, a teasing cough, followed by increased heat of surface, with wandering pains and restlessness. After these symptoms have continued from two to five or six days, a *profuse sweat*, of a sour, rank odour, makes its appearance, accompanied by a harassing pricking or itching of the skin. On an *uncertain day*, a number of small red or white papulæ, about the size of millet-seeds, perceptible to the touch, are observed first on the neck and breast, whence they gradually extend to the trunk and extremities. After *ten or twelve hours*, a small vesicle appears on the top of each pimple. The contents of the vesicles are at first transparent, but afterwards become white; and they have a peculiarly offensive odour. In *two or three days* the vesicles break, and are succeeded by small crusts, which fall off in scales; or the disease terminates in resolution, or by desquamation. The febrile symptoms do not subside on the appearance of the eruption, but after a variable interval.

CAUSES.—*Predisposing.* Lax habit of body; childhood; old age; the female sex; the period of childbirth; debility, however induced, and especially that arising from excessive discharges; dyspepsia.—*Exciting.* Immoderate sweating, produced by excessive heat, or by heating medicines.

DIAGNOSIS.—By the uncommon anxiety and dejection of mind; the profuse sweating, and the peculiarly fœtid, rank odour of the perspiration. Afterwards, the characteristic appearance of the eruption.

PROGNOSIS.—*Favourable.* The fever assuming a mild form, and remitting on the appearance of the eruption; the papulæ of a florid red colour.—*Unfavourable.* The persistence of the sweating, with increase of fever after the appearance of the rash; great anxiety and depression of spirits; profound coma; the sudden disappearance of the eruption, followed by great prostration of strength, anxiety, shortness of breath, rapid, weak, and intermitting pulse, violent vomiting, delirium, and convulsions; the appearance of petechiæ interspersed among the papulæ; anasarcous swellings.

TREATMENT.—The temperature of the apartment should be moderated, and the patient lightly covered. After the bowels have been relieved by an aloetic purge, sulphuric acid with bark or quinine should be given. If there be much restlessness, opium.

ORDER III.

BULLÆ—BLEBS.

PEMPHIGUS . . .	Vesicular Fever.
RUPIA	Atonic Ulcer.

PEMPHIGUS—VESICULAR FEVER.

SYNONYMS.—Bullæ; phlyctena; pompholix; hydatis; febris bullosa; febris vesicularis.

SYMPTOMS.—The rash is ushered in by the usual symptoms of the cold stage of fever; lassitude, headache, sickness, oppression, frequent pulse, and, in some instances, delirium. On an *uncertain day* an eruption takes place of red circular patches, which soon terminate in pellucid blisters, similar to those produced by a burn, resting on an inflamed areola, and distended with a straw-coloured serum. They appear on the face, neck, trunk, arms, mouth, and fauces, and measure half an inch or more in diameter. In a few days the blisters either break and discharge a yellowish, bland, or sharp ichorous fluid, or they begin to shrink, and in a short time disappear.

VARIETIES.—1. *Pemphigus infantlis* attacks young infants in lying-in hospitals. It has been mistaken for syphilis.—2. *Pompholix solitarius* is characterised by the appearance of a single bleb at a time, on successive days, or at short intervals.—3. *Pompholix diutinus* is a chronic disease, occurring, for the most part, in middle-aged and old men, lasting for a considerable time, and sometimes extending over the entire body.

CAUSES.—*Predisposing.* The male sex; adult and old age; summer season.—*Exciting.* Unwholesome and scanty food, bad ventilation, and all the causes of cachexia. Specific infection (?)

DIAGNOSIS.—From *vesicular eruptions*, by the large size and isolation of the vesicles. From *rupia*, by the absence of thick scabs. From *ecthyma*, by the contents of the blebs being transparent. From *erysipelas*, by the regular form and isolated situation of the blisters.

PROGNOSIS.—Generally *favourable*, but often chronic.

TREATMENT.—That of the concomitant fever. In mild cases, gentle aperients, with quinine, and acid drinks. If the patient be cachectic alteratives with tonics or stimulants, and a generous diet.

The local treatment consists in puncturing the vesicles as they appear; and if there is much pain, the use of warm poultices or fomentations.

RUPIA—ATONIC ULCER.

Synonym.—Ulcus atonicum.

Symptoms.—This disease consists in round, flattened, and isolated blebs, about the size of a shilling, filled with serum, which changes after a time to pus. These blebs shrink, and become covered with thick brownish scabs, which, when they fall off, leave ulcers that either heal or continue open for a while. The disease attacks weakly and cachectic subjects, and runs a chronic course, lasting from a few weeks to several months. Its most common seat is the lower extremities.

Varieties.—1. *Rupia simplex* is the mildest form of the disease, and answers to the annexed description.—2. *Rupia prominens* is named from the greater thickness of the scabs, which are formed by several layers of hardened secretion, assume a conical shape, and an appearance not unlike that of an oyster-shell in miniature. The blebs are larger, and the inflammation and subsequent ulceration more extensive than in rupia simplex. This form occurs chiefly in syphilitic subjects.—3. *Rupia escharotica* affects infants in the interval from birth to the first dentition, is accompanied by much constitutional disturbance, and sometimes terminates fatally. The ulcers left after the separation of the scabs heal slowly, secrete a fœtid sanies, and are apt to spread.

Causes.—*Predisposing.* Syphilis, debility.—*Exciting.* Any derangement of the health.

Diagnosis.—From *pemphigus*, by the thick laminated scab, the inflammatory areola, and subsequent ulceration. From *ecthyma*, by the blebs at first containing serum; but in severe cases, the secretions soon becoming purulent, renders the diagnosis difficult.

Prognosis.—*Favourable*, except in severe cases of rupia escharotica.

Treatment.—*Local.* Warm baths; emollient applications, and when the ulcers are obstinate, nitrate of silver, dilute mineral acids, or stimulating ointments.—*General.* Tonics or stimulants, with alteratives, according to the patient's state; and strict attention to diet, ventilation, and cleanliness:—the treatment, in a word, of cachexia.

Order IV.

PUSTULÆ—PUSTULES.

Variola	Small-pox (p. 307).
Vaccina	Cow-pox (p. 313).
Ecthyma	Ecthyma.
Impetigo	Running Tetter.
Acne	Pimple.
Equinia	Glanders (p. 341).

ECTHYMA.

Symptoms.—The eruption begins as distinct, inflamed, circumscribed spots, which increase till they attain a considerable size. Pustules form on the centre, and sometimes enlarge till they closely resemble the bullæ of rupia. In two or three days the pustules dry up, and thick scabs form, which, falling off, leave a purple discoloration, or in severe cases, and in greatly-impaired constitutions, an unhealthy ulcer. The eruption is sometimes accompanied by pain, and by slight fever.

Causes.—*Predisposing.* Childhood and old age.—*Exciting.* All the causes of cachexia.

Diagnosis.—From *acne, impetigo, sycosis, favus, and scabies purulenta,* by the larger size of the pustules, and their inflamed and indurated base. From *variola,* by their size, the absence of the central depression, and their non-contagious character. From *vaccina,* by the cellular structure of the latter, and its contagious nature.

Prognosis.—*Favourable;* but sometimes chronic and tedious.

Treatment.—Emollient applications, and if the ulcers assume a chronic form, nitrate of silver, or the dilute nitric or muriatic acid, or stimulating ointments. Gentle aperients and alteratives, mineral tonics, wholesome food, pure air, exercise, cleanliness, and sea bathing.

IMPETIGO—CRUSTED TETTER.

Synonyms.—Running tetter; scale; cowrap.

Symptoms.—The eruption appears as clusters of small pustules, slightly raised above the skin, bursting in from one to three days, and discharging a purulent fluid, that hardens into thick, yellow, semi-transparent incrustations, resting on an irregular, inflamed base, moistened by a sero-purulent fluid. The eruption may disappear in a few weeks, or it may continue for months or years, the existing patches being succeeded by fresh groups of pustules. There is some constitutional disturbance, with heat and itching of the parts affected.

VARIETIES.—1. *Impetigo figurata* generally occurs in defined patches on the cheeks, but may attack any part of the body; is most common in spring, and in young children, especially during dentition.—2. *Impetigo sparsa* is more irregular in its distribution, and is most frequently seen on the extremities, and round the joints. It is most common in autumn; and it may assume either an acute or chronic form.—3. *Impetigo larvalis* attacks the scalp, ears, and lips in infants. It may also occur on the cheek, which it covers with a thick, yellowish-white crust, resembling a mask, whence its name. In one of its forms it is known as *crusta lactea*.

CAUSES.—*Predisposing.* The seasons of spring and autumn; infancy and childhood; the lymphatic temperament.—*Exciting.* The application of irritating substances to the skin; unwholesome diet; impure air; want of cleanliness. The disease is not contagious.

DIAGNOSIS.—The pathognomonic character is the formation of clusters of small pustules (psydracia), succeeded by scabs of varying tints, from whitish-yellow to dark brown. The pustules of *sycosis* are much smaller, and the exsudation less. *Favus* is contagious, and the character of the crust distinct. (See Dermmycosis Favosa.)

PROGNOSIS.—*Favourable*, in the young and in its acute forms. Obstinate and difficult of cure in the old and in chronic forms.

TREATMENT.—Emollient application, tepid baths, the vapour douche, and gentle aperients. The troublesome itching may be relieved by a prussic acid lotion, containing half an ounce of dilute prussic acid, and the same quantity of alcohol, in an eight-ounce lotion. In chronic impetigo, in addition to tepid baths, alkaline lotions to the skin; the sulphur bath; the dilute acids, or a weak solution of nitrate of silver. Unguentum kreasoti may also be usefully applied.

ACNE—COPPER NOSE.

SYMPTOMS.—This disease attacks the sebaceous follicles of the skin, as isolated pustules, seated on a hard, red base, and terminating in indolent chronic tumours. Its primary form is, in most cases, a hard, red pimple. It is most commonly seen on the nose, cheeks, temples, and forehead, but frequently appears on the back and upper part of the chest, and sometimes on the neck and shoulders. It may exist in all these situations in the same person. It is a chronic disorder, not accompanied by constitutional symptoms; is most frequent from puberty to the age of thirty-five; and occurs in both sexes.

VARIETIES.—1. *Acne simplex* answers to the foregoing description, its most common seat being the shoulders and upper part of the chest; but it may occur on the face.—2. *Acne indurata* consists in the formation of large indurated tumours by the union of several of the smaller follicles. Its common seat is the face, but it often occupies the back of the trunk.—3. *Acne rosacea* is generally met with in old persons, chiefly on the nose and cheeks. As the name implies, the diseased parts have a rosy colour, which, however, is not permanent, but changes at length to a violet. In extreme cases, the superficial veins enlarge, and the cellular tissue, to some depth, becomes inflamed and hardened (acne indurata).—4. *Acne punctata* derives its name from a small black spec, which occupies the summit of each pimple.—5. *Acne sebacea* is named from the smooth waxy appearance which the eruption sometimes assumes.

Diagnosis.—By its seat—the sebaceous follicles.

Prognosis.—In *acne simplex*, favourable. It often disappears of itself with the advance of age. *Acne indurata* and *acne rosacea* are often very obstinate, and defy all modes of treatment.

Causes.—Hereditary predisposition; dyspepsia; excess in eating and drinking; uterine disorders; change of life; the application of irritating substances to the skin of the face.

Treatment.—In young and vigorous subjects, when the disease is recent, a restricted diet, and the avoidance of all stimulating liquors; gentle aperients; spirit lotions, or lotions of the acetate of lead. In chronic cases, and in *acne indurata*, the same general treatment, varied according to the constitution and state of the patient. The local treatment will consist of frictions, with an ointment of iodide of sulphur (gr. xx of the iodide to an ounce of lard), or a paste of sulphur and milk. Dilute acids, or the nitrate of silver, cautiously applied to the eruption, or a lotion of two grains of the cyanide of mercury to an ounce of distilled water, are also beneficial. This lotion should be applied with a camel's-hair pencil, and, after a short interval, washed off with cold water. A course of alterative medicines may be given at the same time. A drop of kreasote in a mucilaginous draught may also be given with advantage two or three times a day. *Acne rosacea* requires a very careful regulation of the diet, proper exercise, abstinence from stimulating liquors, avoidance of heated apartments, hot fires, and mental excitement, with the local application of the vapour douche, or the lotion of cyanide of mercury. In very obstinate cases, blisters have sometimes been applied with advantage.

ORDER V.

PAPULÆ—PIMPLES.

LICHEN.
PRURIGO.

LICHEN.

SYNONYMS.—Papulæ siccæ; scabies sicca vel agria.

SYMPTOMS.—An eruption of small, hard pimples, sometimes of the colour of the skin, sometimes red, generally arranged in patches or clusters, and accompanied by severe itching. Its most common situations are the hands, forearms, neck, and face, but it may attack other parts of the body. It is generally a chronic disorder, but sometimes assumes an acute form. Its usual termination is in desquamation.

VARIETIES.—1. *Lichen simplex* answers to the annexed description. —2. *Lichen strophulosus*, commonly known as *red gum*, *white gum*, or *tooth-rash*, attacks children at the breast, or during dentition, is an acute affection, and generally continues for three or four weeks. It has received many names, according to the arrangement of the pimples, and the colour of the skin.—3. *Lichen urticatus* is characterised by the large size of the papulæ and their close resemblance to the sting of nettles. In *lichen agrius*, the papulæ are confluent, and seated on a highly-inflamed base; the pimples ulcerate and discharge a sero-purulent fluid, which dies into small scabs, and these, falling off, are replaced by thin scales. It is accompanied by intense smarting pain.—4. *Lichen syphiliticus* is characterised by the coppery hue of the rash.

CAUSES.—*Predisposing.* The seasons of spring and summer.—*Exciting.* Extreme heat; irritants; abuse of ardent spirits; jaundice; disorders of the stomach and bowels; and in children, the irritation of teething; syphilis.

DIAGNOSIS.—By the papular form of the eruption, the severe itching, and its non-contagious character.

PROGNOSIS.—Troublesome, and sometimes difficult of cure.

TREATMENT.—In its acute forms, and especially in severe cases of lichen agrius, low diet, brisk aperients, and the antiphlogistic regimen, and tepid emollient applications. Chronic cases require stimulating applications; such as a wash of carbonate of potash, ointments of iodide and biniodide of mercury, and sulphur and iodine vapour.

PRURIGO—PRURITUS.

Symptoms.—A chronic disease, in which the papulæ are of the colour of the skin, larger than those of lichen, and accompanied by intolerable itching. It may occur on any part of the body, but is most common on the neck and shoulders. In some instances it attacks the external parts of generation in both sexes, or the margin of the anus. The papulæ are apt to be torn by friction, and to present on their summit a minute clot of blood, which gives to the rash a very characteristic appearance.

Varieties.—1. *Prurigo mitis* presents a smaller-sized pimple than, 2. *Prurigo formicans*, and is attended with less itching. In the latter disease, the itching is greatly increased by the warmth of bed.—3. *Prurigo senilis* is accompanied by great dryness of skin.

Causes.—*Predisposing.* Childhood and old age, and the seasons of spring and summer.—*Exciting.* All causes of debility, and cachexia; want of cleanliness; unwholesome food, privation, friction, irritation of the skin or of the mucous membranes.

Diagnosis.—From *lichen*, by the larger size of the pimples, by the dark spot on their surface, and by the more severe itching.

Prognosis.—Very difficult of cure, especially in aged persons.

Treatment.—In prurigo mitis and formicans, tepid baths, and gentle aperients. In Pruritus senilis, hot baths, the sulphur bath, or the mixed vapours of iodine and sulphur.

Order VI.

SQUAMÆ—SCALES.

Lepra Vulgaris	Scaly Leprosy.
Psoriasis	Dry Tetter.
Pellagra	Italian Leprosy.
Pityriasis	Dandriff.
Ichthyosis	Fish-skin.

LEPRA VULGARIS—SCALY LEPROSY.

Synonyms.—Kushta of the Hindoos; Baras of the Arabs.

Lepra and psoriasis are considered separately for the sake of convenience; but there is no essential difference between them.

Symptoms.—The eruption begins in the form of small, round, shining spots, slightly raised above the skin, and becoming soon covered with a thin white scale, which, falling off, leaves the surface of the skin red and scaly. The spot increases in size, still retaining its circular form, and is raised at the circumference, and depressed towards the centre, and of a peculiar shining, silvery appearance. These patches vary in size, from a quarter of an inch to an inch and a half. The knees and elbows are the parts commonly affected, but the disease may appear on any part of the body. The spots are often arranged symmetrically on the upper and lower extremities. In cases of long standing, several of the original spots coalesce, and form large scaly patches of a very irregular shape, and the sensibility of the skin is destroyed.

VARIETIES.—1. *Lepra alphoides* is characterised by the small size of the patches, and the silvery appearance of the scales which cover them.—2. *Lepra nigricans* is a rare disease, distinguished chiefly by its darker colour.

CAUSES.—*Predisposing.* The season of autumn; male sex; adult age.—*Exciting.* Most probably syphilis.

DIAGNOSIS.—From *syphilitic lepra*, by the absence of the copper or violet colour, and the greater thickness of the scales. From *favus*, *impetigo*, and *eczema*, by the total absence of moisture, and by its *scaly* nature. The pustular and vesicular diseases produce *scabs*. From *psoriasis*, by the more regular shape of the patches.

PROGNOSIS.—The disease is essentially chronic, obstinate, and difficult of cure, and disappears and returns without obvious cause.

TREATMENT.—This is chiefly local, consisting in the application of the tar ointment, or of the iodide of sulphur ointment, and of sulphur and salt-water baths; and if the disease resist this treatment, preparations of arsenic, or tincture of cantharides internally. The iodide of arsenic (the tenth of a grain three times a day). The constitutional treatment must depend on the existing state of health.

PSORIASIS—DRY TETTER.

SYMPTOMS.—A chronic affection of the skin, consisting of irregular patches, often of considerable size, slightly raised above the surface, fissured, and covered with a white scale. There is some degree of itching, especially at night, but no marked constitutional disturbance. It attacks the eyelids, lips, prepuce, scrotum, backs and palms of the hands, and nails, and in some of these situations has received distinct names. Psoriasis palmaris (grocers' and bakers' itch) and Psoriasis dorsalis (affecting washerwomen) are common varieties.

VARIETIES.—1. *Psoriasis guttata* generally attacks adults in the form of small, round, red patches, often combined with the other forms. —2. *Psoriasis diffusa* is more irregular in shape and size. The patches are often of considerable extent, marked by large fissures, and commonly situated on the limbs.—3. *Psoriasis inveterata* is a very severe form of the disease, and generally occurs in the aged and debilitated. The skin becomes hard, thickened, and covered with a shining scale, which, when removed, leaves a red, fissured, painful, and bleeding surface.—4. *Psoriasis gyrata* occurs in spiral-shaped stripes, generally on the back. It is very rare.

CAUSES.—*Predisposing*. Hereditary predisposition; adult age; spring and autumn; scrofula.—*Exciting*. Abuse of spirituous liquors; unwholesome food; handling of dry powders.

DIAGNOSIS.—See that of Lepra.

PROGNOSIS.—An intractable disease, especially in old and weakly persons.

TREATMENT.—After a short course of mild aperients, and strict regulation of diet,—alterative medicines, such as Plummer's pill, or the fifth of a grain of the biniodide of mercury, with the external application of the iodide of sulphur ointment, or of the mixed vapour of iodine and sulphur. In bad cases of Psoriasis inveterata, preparations of arsenic, iodine, and mercury. (In Psoriasis inveterata attacking delicate anæmic females, Liquoris arsenicalis ♏v, Tr. ferri perchloridi ♏xx, Infus. quassiæ ℥i, is a good combination. The itching and smarting are sometimes greatly relieved by a lotion consisting of ten grains of cyanide of potassium in six ounces of almond emulsion.) (G.)

PELLAGRA—ITALIAN LEPROSY.

SYMPTOMS.—This disease is allied to psoriasis. It sets in in the spring of the year with dusky-red shining patches on the feet and back of the hands, which gradually spread, become studded with tubercles, and covered with dry scales, intersected, as in psoriasis, by cracks and excoriations. The rash is accompanied by slight itching. It subsides and disappears towards autumn to return the following spring in a more severe form, accompanied by anxiety, depression of spirits, and convulsive seizures. Towards the end of autumn the disease again subsides, but less completely, and reappears early the following year; and now extends to every part of the surface, the skin being dry, tough, and shrivelled like that of a mummy. Extreme debility, diarrhœa succeeded by dysentery, dropsy, and epilepsy, follow each other, and wear the patient away, or usher in dementia or mania.

CAUSES.—Obscure. Common in Lombardy and the north of Italy.

TREATMENT.—The disease is believed to be incurable. The remedies prescribed for psoriasis should be persevered with.

PITYRIASIS—DANDRIFF.

DEFINITION.—Non-contagious desquamation of the cuticle.

SYMPTOMS.—The disease consists in an abundant desquamation of branny scales, which are constantly renewed. Its common seat is the scalp, but it attacks other parts. There is itching of the skin, slight in some cases, severe in others; but no constitutional disturbance.

Pityriasis capitis occurs at all ages, and often in new-born infants; is attended by slight itching; and friction detaches numerous white branny scales. *Pityriasis nigra* is characterised by the black colour of the skin.

CAUSES.—*Predisposing.* Youth and old age; female sex; debility. —*Exciting.* Irritation of the skin by heat, by the strong rays of the sun, or by chemical or mechanical irritants.

DIAGNOSIS.—Distinguished from the contagious diseases by the absence of fungi.

PROGNOSIS.—Generally obstinate and difficult of cure.

TREATMENT.—Cleanliness; tepid baths; and tonic and alterative medicines. Alkaline and lead lotions, the zinc or lead ointments, the ointment of nitrate of mercury, and sulphurous baths. The itching may be allayed by lotions containing prussic acid.

ICHTHYOSIS—FISH SKIN.

SYMPTOMS.—The whole body, or certain parts only, especially the palms of the hands, soles of the feet, face, eyelids, outer surface of the limbs, and the joints, are covered by a number of small, hard, thick, dry, dark-brown rhomboidal scales, resembling somewhat the scales of a fish. The rash often has a very disagreeable odour, and is not accompanied by inflammation, pain, or itching of the skin.

CAUSES.—The disease is congenital.

TREATMENT.—No treatment can be expected to remove the disease, but warm baths and the appropriate remedies may be used to keep the skin soft and comfortable.

ORDER VII.

TUBERCULÆ.

LEPRA TUBERCULOSA . . .	Elephantiasis.
FRAMBŒSIA	The Yaws.
MOLLUSCUM	Molluscum.
CHELOIDEA	Keloid.
MALUM ALEPPORUM.	

LEPRA TUBERCULOSA—ELEPHANTIASIS.

SYNONYMS.—Elephantiasis Græcorum. Lepra Egyptiaca. Lepra Hebræorum.

SYMPTOMS.—The disease commonly sets in with erythematous patches, upon which an eruption of soft, livid tumours, of variable size and irregular shape, makes its appearance. The skin and the subjacent tissues are hypertrophied and œdematous, and the parts affected ultimately attain an enormous size. The sensibility of the skin is heightened at first, but subsequently diminished. In very severe cases, the tubercles become inflamed and ulcerated, and discharge an offensive sanies, which concretes into black scabs. The adjoining textures, even to the bones, sometimes become implicated, and their structure completely changed. The constitutional symptoms are merely such as result from the prolonged sufferings of the patient. The disease may occur on any part, but is most common on the legs and face.

CAUSES.—*Predisposing.* Hereditary taint; syphilis; the causes of scrofula; certain climates. Dr. H. V. Carter * has adduced a number of cases which show that there frequently exists a close connection between a varicose state of the lymphatic system and elephantiasis.

PROGNOSIS.—Generally unfavourable.

TREATMENT.—Stimulating applications externally, and arsenical preparations or cantharides internally, in combination with tonic infusions. Change of climate is sometimes beneficial.

FRAMBŒSIA—THE YAWS.

SYMPTOMS.—The disease sets in, without marked premonitory symptoms, in the form of clusters, of variable size and shape, of small dark-red spots resembling flea-bites. On these spots papulæ are developed, which degenerate into indolent vegetations, firm, slightly inflamed, covered with thin dry scales, and resembling, when found in circular groups, raspberries or mulberries. In some instances they become the seat of ulceration, and of a yellow or bloody discharge, which concretes into scabs. The surrounding skin is generally indurated.

CAUSES.—*Predisposing.* The climate of the West Indies, and of parts of America and Africa; scrofula. It is very rare among the white population.—*Exciting.* Contagion.

DIAGNOSIS.—By the peculiar appearance of the eruption.

PROGNOSIS.—Generally favourable. It sometimes assumes a chronic form, and continues for years.

TREATMENT.—The local application of stimulants, such as the red oxide, or yellow iodide of mercury; caustic, or the actual cautery. Internally, tonics and alteratives, and mercurial preparations in small doses; and in chronic cases, the preparations of arsenic. Warm, and vapour baths.

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* Trans. Med. and Phys. Soc. Bombay, No. vii. 1861, p. 186.

MOLLUSCUM.

Symptoms.—Numerous indolent tubercles, from the size of a pea to that of a pigeon's egg, of various forms, sessile or pedunculated, of the natural colour of the skin, containing a little sebaceous matter, unaccompanied by any constitutional disorder, and not attended by pain, inflammation, or ulceration. They present a central depression, leading to an orifice, which is closed with a plug of discoloured sebaceous or albuminous matter. After the removal of this, a coarse needle may be passed down the tumour to some distance within the skin.

Pathology.—Morbid alteration of the hair follicles. The sebaceous glands are sometimes atrophied.

Causes.—Obscure. One form of the disease is contagious.

Treatment.—Fowler's solution was administered by Bateman with success. Biett recommends a solution of sulphate of copper.

CHELOIDEA.

Synonyms.—Cancroide; keloide.

Symptoms.—This is a rare disease, appearing as hard, indolent tubercles, varying in dimension from a very few lines to a few inches, generally isolated, but sometimes in groups, with intervals of sound skin. They are of an irregular oval, square, or angular shape, of a rose or red colour, with a depressed centre, and covered with a thin layer of wrinkled cuticle. They have a remote resemblance to a crab or tortoise—whence the name. The usual situation of these tumours is the space between the mammæ. They are generally chronic, and unattended with danger.

Diagnosis.—By the peculiar appearance above described.

Treatment.—The local application of the vapours of sulphur, iodine, or mercury; of plasters containing iodine, or iodine and opium; and alkaline baths.

The disease advances slowly, and is unattended with danger. The tumours rarely ulcerate; they are generally chronic, but occasionally they disappear spontaneously, leaving a white cicatrix-like mark.

MALUM ALEPPORUM.

Definition.—A tubercular disease of the skin which prevails endemically at Bagdad, in several towns on the banks of the Tigris and Euphrates, and particularly at Aleppo.

SYMPTOMS.—The eruption of one or more tubercles varying in size. At first the tubercle is merely a lenticular eminence, which during the next four or five months gradually increases without local or general symptoms. Acute pain now sets in, followed by deep-fissured and irregular ulceration, discharging a thick, ill-conditioned matter. After five or six months, a dry tenacious scab is formed, which dessicates and separates in the course of one or two months, leaving a deep indelible scar. It attacks persons of all ages, sexes, and conditions of life. Dogs are also liable to it. Children are attacked about the age of two or three; and at Aleppo, according to M. Guilhon, scarcely a single adult escapes.

CAUSE.—Attributed at Aleppo to the use of water from a particular stream. A healthy constitution affords no protection. The disease is rarely complicated with scrofula; is not contagious; nor is it dangerous. There is no specific plan of treatment known.

ORDER VIII.

MACULÆ—SPOTS.

The diseases belonging to this order are of little practical importance. They consist either in change of colour (*colorationes*) or loss of colour (*decolorationes*). To the former belong the common freckle (*lentigo* and *ephelis*), the mole (*spilus*), purpura, petechiæ, bruises, the several forms of *nævus;* to the latter, the universal colourless state of the skin (*albinismus*), and the partial absence of colour (*vitiligo*).

OTHER DISEASES OF THE SKIN.

LUPUS—THE WOLF.

SYNONYMS.—Lupus vorax; Herpes exedens; Formica corrosiva.

SYMPTOMS.—This disease, in all its forms, is characterised by its tendency towards destructive ulceration of the parts which it attacks. It commonly attacks the face, beginning in an ala of the nose. It is rare on the trunk or extremities.

VARIETIES.—1. The *superficial* form of lupus is sometimes confined to the skin, from which the cuticle exfoliates, and leaves the true skin red, shining, and tender to the touch, and bearing a close resemblance to the recent scar of a superficial burn. The redness disappears on pressure. When the disease is arrested it leaves the skin thin and shining, and as if seared by a hot iron.

2. The *deep-seated* form of the disease generally attacks the alæ of the nose, and is often preceded by redness, swelling, pain, and mucous

discharge from the nostrils. The skin first swells and assumes a violet-red colour. After an interval, a small ulcer forms, covered by a scab, beneath which a gradual destruction takes place, first of the skin, then of the cartilages. In extreme cases, the whole nose and even the palate and gums are destroyed; but in some instances, the disease lasts for years without occasioning any great amount of destruction.

3. The *tubercular* form consists in numerous small, soft, red tubercles, which remain stationary for a few weeks, months, or years, and then suddenly become inflamed and enlarged; their bases unite, and their summits ulcerate, forming an irregular spreading ulcer, covered by a dark tough crust. The parts first attacked sometimes partially heal, leaving irregular scars, which become the seat of fresh tubercles and renewed ulceration. The usual seat of this form is the cheek, but it may occur on the neck and chest, and on the anterior surface of the extremities.

4. *Lupus with hypertrophy* is generally confined to the face, and consists in the formation of numerous soft, indolent tumours, which rarely ulcerate, but enlarge at their bases, and the skin and cellular tissue become hypertrophied. The entire face, in this manner, sometimes attains an enormous size, and is hideously disfigured.

These forms may exist together, leading to the destruction of the nose, eyelids, and lips, and producing frightful deformity. They are rarely accompanied by any marked constitutional symptoms.

CAUSES.—*Predisposing.* The periods of childhood and youth; less frequently the adult age up to 40; the female sex; the scrofulous diathesis.—*Exciting.* Obscure. It is not contagious.

DIAGNOSIS.—From *acne*, by the absence of pustules. From *tubercular lepra*, by the insensibility of the skin, and the peculiar fawn colour of the tubercles in this latter disease. From *epithelioma*, by the latter beginning in a single point, surrounded by a hard, circumscribed base, and accompanied by severe darting pains.

PROGNOSIS.—*Favourable*, when recent and limited.—*Unfavourable*, when of long continuance and extensive.

TREATMENT.—This must be chiefly local, and will consist, where the ulceration has not set in, of friction with stimulating ointments containing the iodides of sulphur and mercury. When ulceration has set in, styptics must be used, such as nitrate of silver, chloride of antimony, and the nitrates or iodides of mercury. Alteratives such as iodide of potassium and mercury should be given for a considerable time, and resumed after short intervals.

FARUNCULUS—BOIL.

SYMPTOMS.—Boils consist of hard, circumscribed, dark-red tumours of the cellular membrane, attended by troublesome itching and smarting, sometimes terminating in resolution, but more frequently passing into suppuration and the slow discharge of matter by a single orifice, or by several small openings. Several of these boils follow each other in quick succession, and may continue to harass the patient for weeks together. They are most common on the neck, back, and nates. They are attended with slight constitutional disturbance.

Carbuncles are boils of larger size and more marked character, and are attended by extensive sloughing of the cellular membrane.

CAUSES.—*Predisposing.* Debility, cachexia, and old age.—*Exciting.* Obscure. The mortality from carbuncles in the metropolis rose from 1, 2, 3, or 4 per million, per annum, from 1840 to 1846, to from 7 to 36 per million, per annum, in the interval from 1847 to 1854.

DIAGNOSIS.—From *phlegmon*, by the subacute character of the inflammation, and limited seat of the disease.

PROGNOSIS.—Boils are often tedious, but rarely fatal; but carbuncle, especially in aged persons, is often attended with great danger.

TREATMENT.—In mild cases, saline aperients to keep up a free action of the bowels, and poultices to the boils, when inflamed and painful. In more severe cases, the boils to be freely incised and then poulticed. In carbuncle, free crucial incisions, followed by poultices, and a generous diet, with wine and stimulants. In lingering cases, a course of alterative tonics (see Form. 5, 15, and 31). In most cases of carbuncle we may give bark and ammonia at the outset. Subsequently quinine and acids are required.

The affections of the skin which characterise secondary syphilis have been briefly described under Syphilis, page 579.

CHAPTER IX.

PARASITIC ANIMALS.

1. Intestinal Worms.
2. Other Parasitic Animals.

INTESTINAL WORMS.

1. ASCARIS LUMBRICOIDES	Round Worm.
2. ASCARIS VERMICULARIS	Thread-worm.
3. TRICHOCEPHALUS DISPAR	Long Thread-worm.
4. TRICHINA SPIRALIS.	
5. TÆNIA	Tape-worm.
6. BOTHRIOCEPHALUS LATUS	Broad Tape-worm.

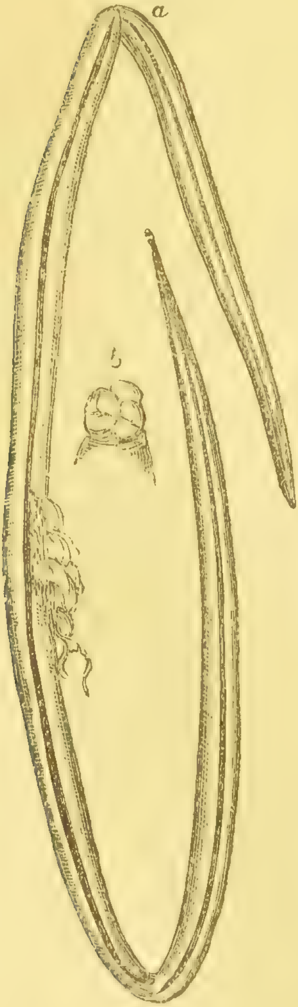
ASCARIS LUMBRICOIDES—ROUND WORM.

SYNONYM.—Lumbricus.

SYMPTOMS.—These vary with the number of the worms and the part of the alimentary canal which they occupy; sometimes (though rarely) there is only one worm. The symptoms commonly present are an uneasy sensation in the abdomen, sometimes amounting to actual pain, and often described as a biting or gnawing; hardness and swelling of the belly; an irregular state of bowels, with scanty evacuations of mucus, sometimes tinged with blood; tenesmus, and, in some cases, dysuria; a variable and sometimes excessive appetite; fœtid breath, and furred tongue. There is itching at the nose and anus, and picking of these parts, and grinding of the teeth in sleep. The constitutional symptoms often amount to those of infantile remittent fever (see p. 332) in young children, and convulsions are sometimes traceable to this cause. It has also given rise to chorea, headache, giddiness; to dry cough and spasmodic asthma; to violent palpitations, and severe hysterical symptoms. In most instances the general health does not suffer in any appreciable degree.

DIAGNOSIS.—There is no certain sign of the presence of these worms till they are discovered in the motions, either with or without the operation of medicines. In some cases they have been discharged from the stomach. They occasionally find their way into the gall bladder and bile ducts, and may give rise to abscess of the liver. Their common habitat is the small intestines. They vary from half a foot to a foot in length. The annexed woodcut shows a specimen of this worm of moderate size; the head, *b*, is magnified about fourfold. It is terminated by three papillæ, which can be spread out into a broad circular sucker during the act of sucking.

Fig. 93.



The posterior extremity of the female (Fig. 93) is comparatively slender and pointed. The corresponding part of the male is bent round like a hook.

The fecundity of this entozoon is prodigious. Dr. Eschricht calculates that the body of the mature female contains at a given time as many as 64 millions of eggs.

PROGNOSIS.—These worms when once proved to exist may generally be removed by appropriate remedies.

CAUSES. — *Predisposing.* Childhood and youth. A cachectic state of constitution.

Exciting.—It is probable that the ova are introduced into the alimentary canal with unripe fruit and vegetables, or with impure water.

TREATMENT.—The parasite is readily expelled by irritant purgatives. Of these the Pulvis scammonii compositus is the best. It may be given alone or in combination with a few grains of calomel. Santonica, or, better, its crystallizable santonine, is a specific against this entozoon. Santonine is not itself purgative, and therefore it may be given to the most delicate children. The dose varies from gr. i to gr. vi. It may be given at bedtime, and generally should be followed by a purge such as gr. x to gr. xv of Pulvis scammonii compositus, or the purgative may conveniently be combined with the anthelmintic. If the use of these remedies by mouth be contra-indicated, enemata of strong infusions of wormwood, rue, tansy, or santonica may be given.

Cowhage (the hairs of the pod of Dolichos pruriens) is a good remedy. It should be made into a smooth electuary with treacle, and given in doses of one or two teaspoonfuls for two or three nights in succession, its use being preceded and followed by an aperient.

ASCARIS VERMICULARIS—THREAD-WORM.

Fig. 94.

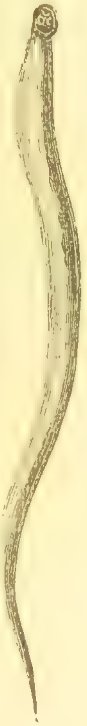
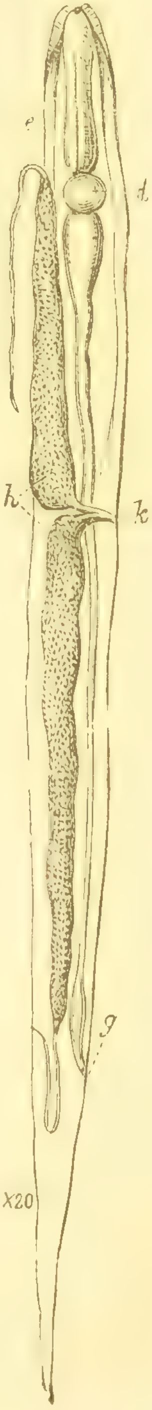


Fig. 95.



Synonyms.—Oxyuris vermicularis. Ascarides. Maw-worm.

Symptoms.—This worm chiefly infests the large intestines and especially the rectum in considerable numbers, and gives rise to great irritation at the verge of the anus. In consequence of their small size they are not only contained in the evacuations, but crawl out of the rectum, so as to be found in the clothes or in the bed, and in females they find their way into the vagina, and cause irritation there. In adult males, they are among the causes of spermatorrhœa. The constitutional symptoms are those described above. (See Ascaris lumbricoides.)

Diagnosis.—The only certain proof of the existence of these worms is their presence in the evacuations, or on the person of the patient. Fig. 94 represents the female eight times the natural size. Fig. 95 still more highly magnified; *d*, stomach; *e*, œsophagus; *g*, anus; *h*, ovaries; *k*, oviduct. They are often found massed together into large round balls. The male is disproportionately small; both extremities are rounded and obtuse, and it has a pale silver-grey colour. The females, which are much more numerous, are distinguished by their thickness and whiteness and by the fine pointed tail.

Mode of Introduction.—Nothing is certainly known respecting the habitat of the parasite out of the body. It is supposed to be conveyed into the intestines in the embryonic condition, by means of salads and unripe fruits.

Prognosis.—These worms are easily removed by remedies; but from their large numbers and rapid production, it is not easy to insure their complete expulsion. New broods are also frequently developed.

Treatment.—Injections are the most appropriate remedies. ℥iv to ℥vi Liquoris calcis, or the same quantity of Infusum anthemidis or Infusum quassiæ, thrown into the rectum, are efficacious remedies. The worms are, however, discharged in considerable numbers by the use of aperients. (Form. 284, 285.)

TRICHOCEPHALUS DISPAR.

Synonyms.—Trichuris, or Long Tread-worm, is a species commonly found in the cæcum and colon. It is distinguished from the common thread-worm by its greater length, the extreme tenuity of the anterior two-thirds, and the increased size of the posterior third of the body. Also, in the case of the male, by the peculiar form of the spiculum and sheath, shown greatly magnified at *b* (Fig. 96). The posterior part of the body is commonly found coiled up as in Fig. 97, which shows the worm of its natural size. These little worms vary from an inch and a half to two inches in length. The males are shorter and more slender than the females. The eggs are oval. The parasite has been observed in Egypt, Ethiopia, France, and in England. In this country it is considered to be rare, but in France it is very common. According to M. Davaine, not less than one-half the inhabitants of Paris are affected by this entozoon.

Fig. 96.

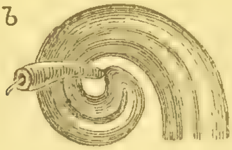
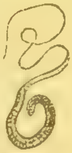


Fig. 97.



The treatment is that of the common thread-worm; but injections are less necessary.

TRICHINA SPIRALIS—TRICHINATOUS DISEASE.

Attention has been directed of late to a train of symptoms associated with the development of this parasite in the system, and stated to be directly due to its presence.

Symptoms.—Extreme lassitude and depression; sleeplessness and loss of appetite; pyrexia, accompanied by severe muscular pains, and occasionally œdema of the joints, followed sometimes by painful and persistent contractions of the flexor muscles of the extremities. In many cases the disease sets in with diarrhœa, and it usually terminates in pneumonia. In some cases typhous symptoms come on and the patient dies unconscious. The disease, when fatal, runs its course within a month of the introduction of the parasite.

Morbid Anatomy.—Muscles, pale reddish grey, speckled with minute lighter-coloured points, which, on minute examination, prove to be Trichinæ in all stages of development, lying free upon and within the sheaths of the muscular fibres. They pervade all the voluntary muscles, and have been observed in the substance of the heart.

SOURCE OF THE PARASITE.—Pigs in Germany are infested with Trichinæ, and their propagation within the human body is secured by the ingestion of raw or imperfectly cooked pork or sausages. The domestic animals are readily infected by the same means. Dr. W. Müller, of Homberg, states ("Lancet," Jan. 23, 1864, p. 93), that an epidemic of trichiasis occurred in Hettstaedt, in Prussia, from eating imperfectly cooked sausages made of pork infected with the parasite. At one time eighty out of a population of about 5500 were afflicted with the disease, and eighteen or twenty had previously died of it.

Man is infested with this parasite much more frequently than was at first supposed; for Dr. Zenker, of Dresden, found Trichinæ in four out of 136 dissections.

Fig. 98.

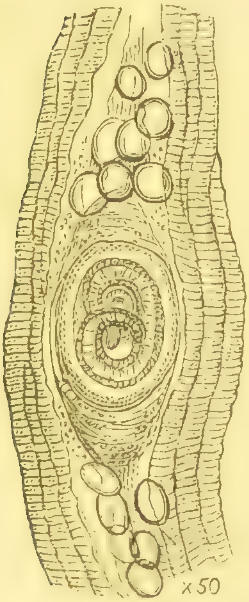
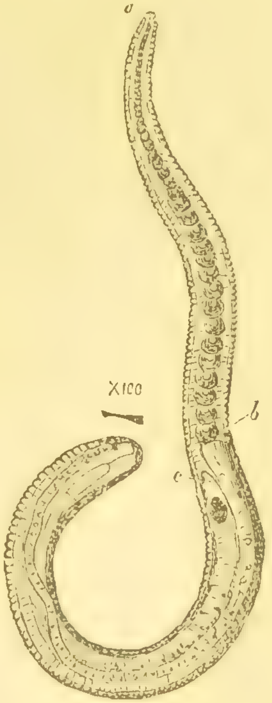


Fig. 99.



The Trichinæ begin to develop almost immediately after their introduction into the stomach, males, females, and innumerable embryos being produced within the intestinal canal, whence, by means that have not been ascertained, the latter make their way to their favourite habitat, the muscles, and produce the violent symptoms above mentioned, until they become enclosed within capsules, in which state they are harmless. Fig. 98 represents the animal incapsulated amongst the muscular fibres; Fig. 99 the free mature animal.

The non-encysted animals are not visible to the naked eye. The encysted also, unless they have undergone cretaceous degeneration, require the aid of a pocket lens for their detection.

TREATMENT.—Since the parasite is carried into the most distant parts of the body with astonishing rapidity, no remedy can be of any avail unless it obtain, like santonine, a speedy admission into the blood.

TÆNIA—TAPE-WORM.

Fig. 100.

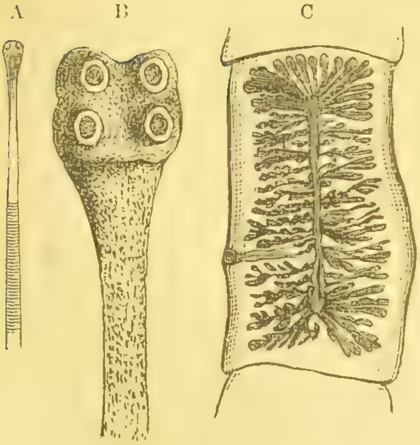
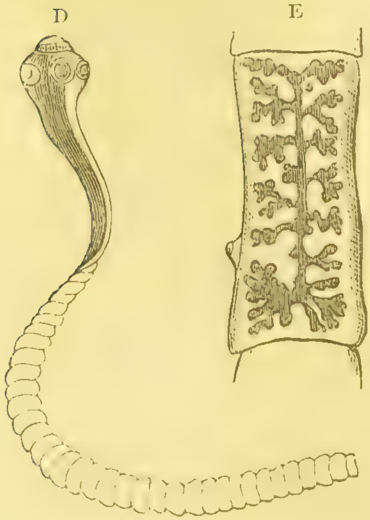


Fig. 101.



SYMPTOMS.—Those already described under Ascaris lumbricoides. The tape-worm occupies the whole track of the intestines, but chiefly the ileum. Joints of the worm (B, Fig. 100) frequently pass from the bowels, even without medicine, or they escape as the patient moves about.

DIAGNOSIS.—The appearance of the joints, or *proglottides*, in the motions. They are flat, about an inch long, and a quarter of an inch broad, and present a little, round, cup-shaped aperture upon one or other side. Two species are met with, the *T. solium*, and the *T. mediocanellata*. In hospital practice in London I find the latter by far the most common. At first sight there is very little to distinguish these two species of parasites. They vary in length from four to twenty feet. T. mediocanellata is the larger and more robust form; it is known by the absence of rostellum and hooklets, and by the more ramified form of the uterine organ. These two forms are illustrated in Figs. 100, 101. A represents the anterior extremity of T. mediocanellata, natural size. B, × 6 showing the flat head, the sucking discs, and the absence of hooklets. C one of the joints × about 2. D, × 4 and E, × 2 show the corresponding parts of T. solium. The ripe joint, or proglottis, is the adult hermaphrodite animal, capable of maintaining an independent existence. The branched organ in the centre is the uterus or ovisac, and contains thousands of ripe spherical eggs.

PROGNOSIS.—It is easy to remove considerable portions of the worm by various remedies. The entire worm is less frequently expelled. Search should always be made for the head. Until this is expelled, the patient is not effectually relieved; but when any number of the small joints at the upper end of the worm are expelled, there is a probability in favour of the head having also been removed.

SOURCE OF THE PARASITE.—Tænia solium is derived from pork, which is liable to be infected with its larval form known as *Cysticercus cellulosæ*. Tænia mediocanellata is in like manner admitted into the body by means of veal and beef, which often contain the larval form of this species.

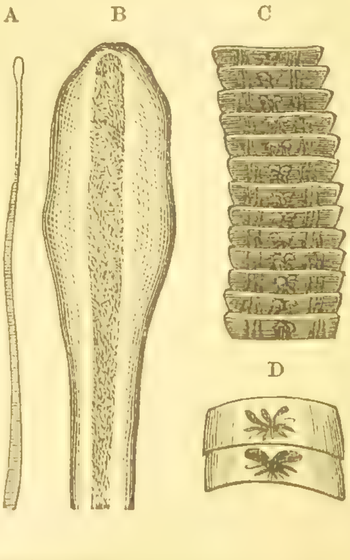
PROPHYLAXIS.—In order to prevent the development of the parasite all animal diet should be perfectly cooked, so that the meat, when brought to table, should be firm, and destitute of tremulousness and blood colour. Pork and sheep's brains, in particular, should be completely cooked. The pernicious habit of eating imperfectly cooked meat doubtless results in other diseases besides those due to parasites.

TREATMENT.—Oil of turpentine, in the dose of half an ounce, followed in two hours by an ounce of castor-oil. This treatment rarely fails of removing the tape-worm, but it is open to the objection that the turpentine acts as a stimulant to the brain and urinary organs, sometimes producing painful strangury. It is much less apt, however, to produce this effect if speedily followed by castor-oil. Kosso, in the form of infusion (℥ss—℥i to Oss of water), taken at a single dose. This is an extremely effective remedy. The liquid extract of the male fern-root in the dose of ʒi or ʒiii. It may be given in capsules. This remedy never fails to expel the parasite.

The Kamela or Rottlera tinctoria in the dose of gr. l to gr. c in water.

These remedies should be given on an empty stomach: an ounce of castor-oil should be taken over night, the anthelmintic in the morning, and a second ounce of castor-oil two hours afterwards. No food to be taken while the medicines are being administered.

Fig. 102.



BOTHRIOCEPHALUS LATUS—BROAD TAPE-WORM.

SYMPTOMS.—Those of Tænia. The Bothriocephalus latus is very rare in England. It is as common in Switzerland and Russia as

Tænia is in England. It occurs in France, in common with the Tænia solium.

DIAGNOSIS.—From the common tape-worms by the shape of the head, which is marked in the direction of its length by a groove, and by the absence of rostellum, hooklets, and suckers. The proglottis is also quite distinct. The head, A and B, and some of the mature segments, C and D, are shown in the subjoined engraving; B and D are magnified. (Leuckart.)

TREATMENT.—That of the common tape-worm.

OTHER ANIMALS PARASITIC WITHIN MAN.

In addition to the animal parasites particularly treated of in the preceding pages and body of the work generally, the following are occasionally met with:

CESTOIDEA.—Tænia cucurbitina, grandis, saginata, acanthotrias, flavopuncta, marginata, nana, and elliptica (T. canina). Bothryocephalus cordatus. These parasites inhabit the alimentary canal, but may be carried to any part of the system.

TREMATODA.—Distomum hepaticum, crassum, lanceolatum, heterophyes. These parasites inhabit the portal vein and gall ducts. Distomum ophthalmobium has been found in the eye. (?)

NEMATOIDEA.—Ascaris mystax (intestines); Filaria oculi seu lentis; Filaria bronchialis; Tetrastomum renale and Strongylus gigas (in the kidney); Anchylostomum duodenale (duodenum); Spiroptera hominis and Dactylius aculeatus (discharged from the bladder).

The *treatment* of these parasitic animals will be determined by their locality and the symptoms which they occasion. The tape-worms require the same remedies as T. solium. The Ascaris mystax and Anchylostomum duodenale, may be expected to yield to the treatment prescribed under Ascaris lumbricoides. When the parasites are known to inhabit the bladder, the injection of bitter infusions may be employed.

CHAPTER X.

POISONS.

THE subject of Poisons is here treated simply as a branch of the Practice of Medicine. For minute details of their tests, symptoms, post-mortem appearances, antidotes, and proper treatment, the reader is referred to works on Toxicology, or Forensic Medicine. The antidotes for the principal poisons are given at the end of the chapter. The old division is retained, as being convenient in practice, into: 1. Irritant Poisons. 2. Narcotic Poisons. 3. Narcotico-irritant Poisons.

1. IRRITANT POISONS.

DEFINITION.—Poisons which cause corrosion, inflammation, or irritation in the alimentary canal, with or without specific remote effects on other organs.

SYMPTOMS.—After an interval varying from a few seconds to half an hour or more from the swallowing of the poison, vomiting and purging, with pain in the stomach and bowels, increased by pressure; and accompanied by inflammatory fever, or extreme prostration of strength. Pain and constriction of the mouth, throat, and gullet, accompanying or following the act of swallowing; intense thirst; hoarse voice, wheezing respiration, and cough; discharge of blood from the stomach and bowels; tenesmus; strangury, dysuria, or suppression of urine; convulsions and epileptic seizures; and cutaneous eruptions, are symptoms of more or less frequent occurrence, but not present in every instance. The remote constitutional effects, whether common to other severe injuries, or specific, are also subject to great variety.

MORBID APPEARANCES.—Marks of corrosion, inflammation, suppuration, or gangrene in the stomach and upper part of the alimentary canal, extending, in certain cases, to the gullet, throat, and mouth, and through the whole length of the intestines. Perforation of one or other of these parts. In certain cases, signs of inflammation in the windpipe and lungs; in the peritoneum and pleura; in the rectum and bladder; in certain other cases, peculiar stains or indications of the action of the poison on the mouth, throat, gullet, stomach, and duodenum.

DIAGNOSIS.—*During life*, from English and Asiatic cholera, in many cases of irritant poisoning, by the blood mixed with the evacuations from the stomach and bowels, and in many other cases by the effect of the poison upon the mouth, throat, and gullet. In other instances, again, by the specific remote effects of the poison. (*E.g.* inflamed eyes, gastritis, and rapid pulse, in poisoning by arsenic; salivation in poisoning by the preparations of mercury; jaundice, in poisoning by phosphorus and the preparations of copper; pneumonia, and extreme depression, in poisoning by tartar emetic; inflammation of the urinary organs, in poisoning by cantharides and phosphorus.) *After death*, by the traces of acute inflammation, and its consequences in the several portions of the alimentary canal; and in many cases by appearances in the upper part of the canal appropriate to particular irritant poisons, or to the corrosive poisons as a sub-class of the irritants.

PROGNOSIS.—Dependent on the nature of the poison, the degree of concentration, the vehicle, the dose, the prompt administration or otherwise of an antidote, the state of the stomach (whether full or empty) when the poison was swallowed, and the age and strength of the patient.

MORTALITY.—The mortality varies, in the case of the several poisons contained in this class, from more than half the cases down to a rarely fatal result.

TREATMENT.—After the administration of an antidote (if any exist), the prompt and complete evacuation of the stomach by the stomach-pump (except in the case of strong corrosive poisons), or by emetics of common salt, mustard, ipecacuanha, or sulphate of zinc, assisted by large draughts of warm water, and tickling the throat with a feather or with the finger. After the evacuation of the stomach, the free use of milk, gruel, barley-water, and abstinence from all solid food. When inflammation runs high, ice or iced-water; when great tenderness is present, leeches followed by warm fomentations. When the bowels cease to discharge blood, and the patient suffers from tenesmus or constipation, one or two tablespoonfuls of castor-oil, with twenty drops or half a drachm of laudanum, mixed with a small quantity of hot milk. Extreme prostration will require the use of larger doses of laudanum, with wine or brandy. When fever runs high, it may be necessary to draw blood from the arm. Occasional symptoms, and symptoms peculiar to certain poisons only, must be treated in the same manner as the same symptoms due to other causes.

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2. NARCOTIC POISONS.

DEFINITION.—Poisons which act on the brain and spinal marrow, and give rise to symptoms referable to those organs, without exciting any irritation or inflammation of the alimentary canal.

SYMPTOMS.—After an interval, varying from a few seconds to one or two hours from the swallowing of the poison, the patient is seized with giddiness, headache, dimness of vision, singing in the ears, drowsiness passing into stupor, and ending in complete coma, with palsy, convulsions, epileptic fits, or tetanic spasms.

MORBID APPEARANCES.—Often very slight. The brain sometimes healthy; the veins and sinuses sometimes gorged with blood; with serum in the ventricles and at the base. In rare instances extravasation of blood.

DIAGNOSIS.—From the close resemblance of the symptoms of some forms of narcotic poisoning and of apoplexy, no satisfactory diagnostic marks can be laid down for narcotic poisons as a class; and in any case the history of the first appearance and progress of the symptoms will constitute our principal means of distinction.

PROGNOSIS.—This, too, cannot be laid down for the entire class, as the chances of recovery vary very greatly with the particular poison which has been taken.

TREATMENT.—The prompt use of the stomach-pump, and, until that can be procured, the administration of emetics of common salt, mustard, ipecacuanha, or sulphate of zinc. The cold affusion as a shock, especially in the early stage of the poisoning. The patient to be kept awake by walking him up and down, or by flecking his hands and feet with a wet towel. After the complete evacuation of the stomach, strong coffee and tea, and diffusible stimulants, to be freely administered. The bowels to be relieved by full doses of castor-oil. So long as the surface continues cold and livid, the heat to be restored by assiduous frictions, and by warm bottles to the feet and pit of the stomach, or by the hot-air bath. In extreme cases, artificial respiration, and galvanic shocks passed from the spine of the neck to the pit of the stomach. This is the treatment of cases of poisoning by opium. In poisoning by prussic acid, the cold affusion is the first remedy to be employed; and in cases which survive some minutes or hours, heat and assiduous frictions, to restore warmth to the surface, must take the place of the compulsory exercise necessary in poisoning by opium, and by other poisons producing well-marked narcotic effects.

For the treatment of poisoning by chloroform, see page 426.

3. NARCOTICO-IRRITANT POISONS.

SYNONYM.—Narcotico-acrids.

DEFINITION.—Poisons which produce the combined effects of the irritant and narcotic poisons; the irritant action being generally less violent than in the case of the pure irritants, and delirium being of more common occurrence than in cases of poisoning by the pure narcotics.

SYMPTOMS.—At an interval varying from about an hour to three or four hours after swallowing the poison (which, in many cases, has a peculiar taste), giddiness, disorders of the senses of sight and hearing, delirium, convulsions, tetanic spasms, stupor passing into coma; preceded or accompanied by vomiting and purging, with pain and tenderness of the abdomen. As a general rule the narcotico-irritants act chiefly or wholly as narcotics in very large doses, and mainly as irritants in small doses.

MORBID APPEARANCES.—Not strongly marked or uniform, consisting of marks of inflammation in the stomach and intestines, with congestion of the brain.

DIAGNOSIS.—From most of the pure irritants by the presence of symptoms of narcotic poisoning. From the pure narcotics by the presence of more or less irritation in the alimentary canal.

The following indications of particular poisons or groups of poisons may be added:—

Delirium affords a presumption of poisoning by belladonna, hyoscyamus, and stramonium, or some plant belonging to the natural order, *Solanaceæ*. Symptoms of *intoxication* give a like presumption of the use of alcohol, æther, chloroform, or of some liquid or gaseous hydro-carbon; *Tetanic convulsions* are nearly conclusive of the presence of strychnia, or of some substance containing it; *extreme muscular weakness* affords a presumption of the operation of hemlock, aconite, tobacco, lobelia inflata, and the Calabar bean; *sudden prostration* following quickly on the swallowing of the poison afford a strong presumption of the action of prussic acid, or oxalic acid; and a very slow and weak pulse attends poisoning by digitalis.

PROGNOSIS.—Dependent chiefly on the early or late commencement of the treatment, and on the circumstances mentioned under Narcotics.

TREATMENT.—The prompt use of the stomach-pump, or of emetics, followed by aperients and enemata, if required. The rest of the treatment to be determined by the symptoms present; if chiefly those of irritant poisoning, the treatment proper to that class of poisons; if chiefly of narcotic poisoning, the treatment prescribed under Narcotic Poisons.

ANTIDOTES TO THE PRINCIPAL POISONS.

Acids, Mineral.—Calcined magnesia or carbonate of magnesia; common chalk, whiting, prepared chalk, or compound chalk powder; a dilute solution of carbonate of soda, or potash; in an emergency, the plaster of an apartment, broken up and diffused through water; soap suds, or oil.

Acids, Vegetable.—Magnesia, common chalk, whiting, prepared chalk, or compound chalk powder. Carbonate of soda.

Alum.—Calcined magnesia.

Ammonia and its Carbonate.—Vinegar and water, oil.

Antimony, Chloride of.—Magnesia, carbonate of soda. Tincture of bark.

Arsenious Acid and the Soluble Arsenites.—No certain antidotes. Hydrated oxide of magnesia; magnesia in a state of fine division; the hydrated sesquioxide of iron; or powdered charcoal may be given. Also, a mixture of oil and lime water.

Baryta, Soluble Salts of.—Sulphate of magnesia or of soda.

Baryta, Carbonate of.—Sulphate of magnesia with weak vinegar.

Chlorine.—Ammonia; magnesia.

Hydrocyanic Acid.—After cold affusion, liquor chlorinii, the mixed oxides of iron diffused through water, ammonia, and the treatment of asphyxia.

Iodine.—Starch; a very dilute solution of caustic potash or soda.

Iron, Sulphate of.—Carbonate of soda or carbonate of ammonia.

Lead, Soluble Salts of.—Sulphate of soda or magnesia.

Lead, Carbonate of.—Sulphate of magnesia with weak vinegar.

Lime.—Vinegar and water.

Mercury.—Soluble Salts of.—White of egg; flour and water.

Morphia, and the alkaloids generally, finely divided animal charcoal, tannin; dilute tincture of iodine.

Muriatic Acid.—*See* Acids, Mineral.

Nitric Acid.—*See* Acids, Mineral.

Opium and its Preparations.—No antidote. Treatment by the stomach-pump or mustard emetics, cold affusion, and forced exercise. Then strong coffee. In extreme cases, electro-magnetism and artificial respiration.

OXALIC ACID AND THE SOLUBLE OXALATES.—Common chalk, whiting, prepared chalk, or compound chalk powder, magnesia.

PHOSPHORUS.—No antidote. Magnesia diffused through water, or suspended in mucilage, may be given with advantage.

POTASH AND ITS CARBONATES.—Vinegar and water; oil.

SILVER, NITRATE OF.—Solution of common salt.

SODA AND ITS CARBONATES.—Vinegar and water; oil.

STRYCHNIA.—Chloroform, nicotine and conia, and tincture of aconite.

SULPHURET OF POTASSIUM.—Weak solution of chlorine.

SULPHURIC ACID.—*See* Acids, Mineral.

TARTAR EMETIC.—Tannin; tincture of bark, kino, or catechu; strong tea.

ZINC, CHLORIDE AND SULPHATE OF.—A dilute solution of carbonate of soda.

CLASSIFICATION OF REMEDIES AND FORMULÆ.

EXCEPT when otherwise stated, the medicines prescribed in the following Formulæ are those of the British Pharmacopœia of 1867, and the *imperial weights and measures* adopted in that work are of course employed here. They are as follows:—

WEIGHTS.

1 pound ℔j = 16 ounces = 7000 grains.
1 ounce ℥j = 437·5 „

MEASURES.

1 gallon . Cj = 8 pints . . = Oviii.
1 pint . Oj = 20 fluid ounces = f ℥xx.
1 fluid ounce f ℥j = 8 drachms . = ʒviii.
1 drachm ʒj = 60 minims . = ♏ lx.

The doses are full doses for Adult Males, unless otherwise stated. For Adult Females they must be somewhat diminished, according to the judgment of the practitioner. In prescribing for younger persons of either sex, the subjoined table of doses may be safely followed. The dose for the Adult Male is taken at 60 *grains or* 60 *minims.*

	Gr. or ♏.			Gr. or ♏.	
Adult male . . .	lx.	or 1	3 years	x.	or $\frac{1}{6}$
14 years	xxx.	or $\frac{1}{2}$	1 year	vi.	or $\frac{1}{10}$
7 years	xx.	or $\frac{1}{3}$	6 months	iii.	or $\frac{1}{20}$
5 years	xv.	or $\frac{1}{4}$	3 months	ii.	or $\frac{1}{30}$

Except when otherwise indicated, each prescription is for a single dose, and such as may be repeated every four or six hours.

STIMULANTS.

1. GENERAL STIMULANTS.

(Including Diffusible Stimulants and Stimulant Antispasmodics.)

1. Ammoniæ carbonas . . . . Dose gr. iii. to gr. x.
2. Liquor ammoniæ . . . . „ ♏ v. — ♏ x.
3. Liquor ammoniæ acetatis . . . . . . „ ʒ ii. — ʒvi.
4. Liquor atropiæ sulphatis and liquor atropiæ „ ♏ iii. — ♏ v.

5.	Spiritus ammoniæ aromaticus	Dose ♏xx. to ʒi.
6.	Spiritus chloroformi	,, ʒss. — ʒii.
7.	Ammoniæ hydrochloras	,, gr.x. — xxx.
8.	Æther (sulphuricus)	,, ♏xx. — ʒi.
9.	Spiritus ætheris nitrosi	,, ʒss. — ʒii.
10.	Mistura spiritûs vini Gallici	,, ℥j. — ℥ii.
11.	Oleum anethi, anthemidis, anisi, carui, caryophylli, cinnamomi, juniperi, sabinæ, lavandulæ, terebinthinæ, rorismarini, menthæ (viridis et piperitæ), myristicæ, pimentæ, cajuputi, pulegii, limonis, rutæ	,, ♏iii. — ♏v.
12.	Spiritus camphoræ, cajuputi, armoraciæ compositus, juniperi, menthæ, piperitæ, myristicæ, lavandulæ, and rorismarini	,, ♏xx. — ♏xl.
13.	Tinctura aurantii; assafœtidæ; belladonnæ; benzoini; bucco; capsici; cardamomi composita; cascarillæ; castorei; chloroformi composita; cinchonæ flavæ; cinchonæ composita; cinnamomi; gentianæ composita; guaiaci ammoniata; lavandulæ composita, limonis; lupuli; myrrhæ; serpentariæ; sumbul; valerianæ; valerianæ ammoniata; and zingiberis	,, ʒss. — ʒii.
14.	Camphora	,, gr. v. — gr. x.
15.	Aqua camphoræ	,, ℥i. — ℥ii.
16.	Moschus	,, gr. v. — xx.
17.	Assafœtida	,, gr. v. — xx.
18.	Kreasotum	,, ♏ i. — ♏ii.
19.	Phosphorus	,, gr. $\frac{1}{8}$ — $\frac{1}{4}$
20.	Sumbul radix	,, gr. x. — gr. xx.

The aqua camphoræ, the distilled waters (aqua anethi, carui, fæniculi, cinnamomi, pulegii, pimentæ, menthæ—viridis and piperitæ), and the tonic infusions (infusum anthemidis, aurantii, bucco, calumbæ, caryophylli, cascarillæ, cinchonæ flavæ, cuspariæ, gentianæ compositum, chiratæ, krameriæ, lupuli, quassiæ, serpentariæ, and valerianæ), are appropriate vehicles for the stronger stimulants, and the syrups (especially the syrupus aurantii and zingiberis) may be used to impart an agreeable flavour.

Stimulants in the form of Draught.

1. ℞. Ammoniæ carbonatis gr. x.
Liq. ammoniæ acetatis ʒiii.
Syrupi aurantii ʒj.
Aquæ ℥iss. Fiat haustus.

2. ℞. Sp. ammoniæ aromatici f ʒss.
Træ. lavandulæ compositæ ʒi.
Syrupi aurantii f ʒi.
Aquæ cinnamomi ℥i. M.

3. ℞. Tr æ. guaiaci ammoniatæ f ʒss.
Decocti cinchonæ flavæ, f ℥iss. 1. M. fiat haustus.

4. ℞. Misturæ guaiaci ℥iss.
Ammon. carb. gr. viii. M.

5. ℞. Spiritûs ætheris ʒj.
Tincturæ lavandulæ co. ʒi.
Infusi valerianæ ℥iss. M.

6. ℞. Spiritûs ætheris ♏xxx.
Spiritûs ammon. arom. ʒss.
Spiritûs cajuputi ʒss.
Infusi cascarillæ ℥iss. M.

7. ℞. Camphoræ gr. v.
Spiritûs rectificati ♏j.
Reduce to a powder, and add—
Pulveris acaciæ ʒss.
Syrupi limonis ʒss.
Aquæ menthæ viridis ℥iss.

8. ℞. Moschi gr. xx.
Pulv. tragacanthæ co. ʒss.
Aquæ cinnamomi ℥iss. M.

9. ℞. Tr. valerianæ ammoniatæ.
Tincturæ assafœtidæ āā ʒj.
Aquæ pimentæ ℥iss. M.

10. ℞. Tincturæ sumbul ʒj.
Træ. lavandulæ comp. ʒii.
Infusi valerianæ ℥iss.

11. ℞. Radicis armoraciæ excisæ ℥ii.
Seminis sinapis ℥jss.
Baccæ juniperi contusæ ℥iii.
Vini Xerici Oiii.
(Digest for one week, and strain. Dose, a wine-glassful. *Non-officinal.*)

12. ℞. Olei terebinthinæ ʒiv.
Ovi vitelli unius.
Sacchari ℥ss.
Aquæ ℥iv. M. ($\frac{1}{4}$—$\frac{1}{6}$.)
(The whole, mixed with a pint of gruel, may be also used as an enema in certain cases.)

13. ℞. Kreasoti ♏i.
Misturæ amygdalæ ℥iss. M.

14. ℞. Tincturæ belladonnæ ♏xx.
Ammonia carbonatis gr. v.
Misturæ camphoræ ℥iss. M.

15. ℞. Phosphori gr. v.
Olei olivæ f ℥ss.
Digest a fortnight in the dark, and add—
Olei carui ♏iv.
(Dose, 15 drops cautiously increased, in milk. *Non-officinal.*)

Stimulants in the form of Bolus, and Powder.

16. ℞. Terebinthinæ Canadensis gr. v.
Pulvis glycyrrhizæ, quantum sufficit. Fiat bolus.

17. ℞. Camphoræ.
Moschi āā gr. x. M.
(The powder to be taken in barley water; in hysteria.)

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2. STIMULANTS ACTING LOCALLY UPON CERTAIN SYSTEMS OR PARTS.

THROUGH THE NERVES ON THE MUSCULAR SYSTEM.

(*a.*) *On the Voluntary Muscle.*

1. Extractum nucis vomicæ . dose gr. $\frac{1}{4}$, gradually increased to gr. ii.
2. Strychnia . . . . . „ gr. $\frac{1}{30}$, cautiously increased to gr. $\frac{1}{12}$.
3. Liquor strychniæ . . . „ ♏v. (= $\frac{1}{24}$ gr.) . ♏x. = $\frac{1}{12}$ gr.

18. ℞. Strychniæ gr. i.
Dissolve in a few drops of alcohol, and then mix intimately with sufficient extract of gentian and liquorice powder to make 24 pills (one for a dose).

In the form of Mixture.

19. ℞. Liquoris strychniæ ♏v.
Aq. menthæ piperitæ ℥iss.
ft. H.

20. ℞. Liquoris strychniæ, ♏iii.
Quiniæ disulphatis gr. ii.
Acidi hydrochlorici dil. ♏v.
Aquæ cinnamomi ℥iss. ft. H.

(*b.*) *On the Involuntary Muscle.*

ON THE UTERUS.

1. Extractum ergotæ liquidum; dose, ♏xv. to ʒi.
2. Infusum ergotæ; dose, ℥i. to ℥ii.
3. Tinctura ergotæ; dose, ʒi. to ʒii.

ON THE URINARY ORGANS.

Cantharis vesicatoria.	Dose in powder gr. ½, cautiously increased.
Cantharidis tinctura.	,, ♏x., cautiously increased.
Sabinæ tinctura.	,, ♏xx.—ʒi.
Sabinæ oleum.	,, ♏i.—v.

In the form of Draught.

21. ℞. Tinct. cantharidis ♏x.
Infusi. quassiæ ℥iss. M.

22. ℞. Tincturæ sabinæ ʒss.
Spiritûs myristicæ ʒss.
Infusi Bucco ℥iss. M.

23. ℞. Tinct. cantharidis ♏x.
Tinct. ferri perchloridi ♏xv.
Aquæ pimentæ ℥iss. M.

24. ℞. Olei sabinæ ♏ii.
Spiritûs chloroformi ʒss.
Aquæ ℥iss. M.

ON THE MUCOUS MEMBRANES.

Copaiba	dose	♏xx.	to	ʒii.
Copaibæ oleum	,,	♏v.	—	♏xx.
Pulvis cubebæ	,,	gr. xx.	—	gr. xxx.
Cubebæ oleum	,,	♏v.	—	♏xx.
Confectio piperis	,,	gr.	—	c.
Balsamum Peruvianum	,,	♏xv.	—	♏xxx.
Confectio terebinthinæ	,,	gr. xxx.	—	l.
Balsamum tolutanum	,,	gr. xx.	—	gr. xxx.
Syrupus tolutanus	,,	ʒi.	—	ʒii.
Tinctura tolutana	,,	ʒss.	—	ʒi.
Tinctura benzoini composita	,,	ʒss.	—	ʒi.
Oleum terebinthinæ'	,,	♏x.	—	ʒi.
Terebinthina Canadensis	,,	gr. v.	—	xx.

In the form of Draught, &c.

25. ℞. Copaibæ ʒss.
Liquoris potassæ ♏x.
Syrupi tolutani ʒss.
Aq. Menth. pip. ℥iss. M.

26. ℞. Pulvis cubebæ ʒss.
Syrupi papaveris ʒj.
Aquæ cinnamomi ℥iss. M.

27. ℞. Confectionis piperis.
——— sennæ.āā ʒj. M.

28. ℞. Tinct. benzoini co. ʒss.
Syrupi tolutani ʒj.
Pulv. tragacanth gr. c.
Aquæ ℥iss. M.

In the form of Pill or Powder.

29. ℞. Copaibæ.
Magnesiæ āā gr. x. fiant boli duo.

30. ℞. Pulveris cubebæ ʒi.
Sodæ bicarbonatis ʒss. fiat pulvis.

Inhalations.

Vapor chlorinii. Vapor kreasoti. Vapor iodinii.

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3. EXTERNAL AND LOCAL STIMULANTS.

1. Caustics.

1. Acidum nitricum. Acidum sulphuricum. Acidum arseniosum.
2. Argenti nitras.
3. Cupri sulphas.
4. Liquor ammoniæ fortior.
5. Liq. hydrargyri nitratis acidus.
6. Soda caustica.
7. Potassa caustica.
8. Zinci chloridum et sulphas.

2. Vesicants.

1. Charta epispastica.
2. Emplastrum cantharidis.
3. Liquor epispasticus.
4. Linimentum crotonis.
5. Oleum sinapis.

3. Rubefacients.

1. Acetum cantharidis.
2. *Acidum* aceticum; hydrochloricum dilutum; nitricum dilutum; nitro-hydrochloricum dilutum; sulphuricum dilutum; sulphurosum.
3. Armoraciæ radix.
4. *Linimentum* ammoniæ; camphoræ; camphoræ compositum; chloroformi; hydrargyri; iodinii; saponis; sinapis compositum; terebinthinæ; terebinthinæ aceticum. *Emplastrum* ammoniaci cum hydrargyro; galbani; picis; resinæ; calefaciens.
5. *Liquor* ammoniæ; calcis chlorinatæ; sodæ chlorinatæ.
6. Mezerei extractum æthereum.
7. *Oleum* cajuputi; caryophylli; crotonis; rutæ; rorismarini; terebinthinæ.
8. Phosphorus.
9. *Pix* Burgundica; liquida; resina; terebinthina Canadensis. Thus Americanum; balsamum Peruvianum; balsamum tolutanum.
10. Sinapis cataplasma.
11. *Spiritus* ammoniæ aromaticus; cajuputi; camphoræ; chloroformi; rectificatus; tenuior; rorismarini.
12. Sulphuris iodidum.
13. Tinctura arnicæ; cantharidis; capsici; iodinii; pyrethri.
14. *Unguentum* antimonii tartarati; calomelanos; hydrargyri iodidi rubri; hydrargyri nitratis; hydrargyri oxidi rubi; hydrargyri ammoniati; iodinii compositum; kreasoti; potassii iodidi; resinæ; elemi; cantharidis; sulphuris; terebinthinæ; sabinæ.
15. Zinci sulphas.

Stimulant Lotions.

31. ℞. Acidi nitrici.
Acidi hydrochlor. āā ♏xx.
Aquæ f ℥viii. M. fiat lotio.

32. ℞. Acidi sulphurici diluti.
Aquæ destillate āā f ℥ss. M.

33. ℞. Acidi sulphurosi.
Aquæ, partes æquales. M.

34. ℞. Liq. ammoniæ fort. f ℥i.
Spiritûs rorismarini f ℥ss.
Tinct. camphoræ f ʒii. M.
(A highly-stimulant application.)

35. ℞. Zinci sulphatis gr. vi.
Spiritûs rorismarini.
Tincturæ Lavandulæ compositæ āā ʒiss.
Aquæ f ℥vss. M.
(Red wash.)

Stimulant Collyria.

36. ℞. Aluminis gr. v.
Aquæ ℥i. Solve.

37. ℞. Argenti nitratis gr. i.
Aquæ ℥i. Solve.

38. ℞. Cupri sulphatis gr. v.
Aquæ ℥i. Solve.

39. ℞. Zinci sulphatis gr. ii.
Vini Opii ʒii.
Aquæ ℥i. Solve.

40. ℞. Hydrarg. bichloridi gr. ¼.
Aquæ destillatæ f ℥i. Solve.

41. ℞. Potassii iodidi gr. vii.
Iodinii gr. iii.
Aquæ destillatæ Oi. Solve.

Stimulant Baths.

42. ℞. Acidi hydrochlorici ℥ii.-℥iv.
Aquæ q. s. M.

43. ℞. Acidi nitro-hydrochlorici diluti Oj.
Aquæ tepidæ (96°) q.s. M.
(The acid may be used in the proportion of ℥vi. to 8 gallons, as a bath or lotion.)

44. ℞. Kreasoti ʒii.
Glycyrini ʒii.
Aquæ calidæ Cxxx. M.

45. ℞. Iodinii ʒii.
Liquoris potassæ f ℥ii.
Aquæ calidæ Cxxx. M.

46. ℞. Hydrargyri perchlor. gr. c.
Acidi hydrochlorici ʒi.
Aquæ Cxxx. Solve.

47. ℞. Sulphuris precipitati ℥ii.
Sodæ hyposulphitis ℥i.
Acidi sulphurici diluti ℥ss.
Aquæ Cxxx. M.

Stimulant Liniments.

48. ℞. Liquoris ammoniæ f ℥ss.
Linimenti saponis f ℥iss. M.

49. ℞. Tincturæ cantharidis f ℥ss.
Linimenti saponis f ℥iss.
(A good application to chilblains.)

50. ℞. Camphoræ gr. c.
Olei terebinthinæ f ℥ss.
Linimenti camphoræ co. ℥ss M.

51. ℞. Pulvis seminis sinapis gr. c.
Acidi acetici f ℥ss.
Olei terebinthinæ f ʒiss. M.

52. ℞. Antimonii tartarati gr. c.
Aquæ rosæ f ℥ii.
Tincturæ cantharidis f ℥i. M.

53. ℞. Acidi sulphurici ʒiss.
Olei terebinthinæ ℥ss.
Olei olivæ f ℥iss. M. caute.

54. ℞. Olei cajuputi f ℥iss.
Linimenti camphoræ compositi f ℥ss. M.

Stimulant Ointments.

55. ℞. Argenti nitratis gr. x.
Unguenti simplicis gr. c. M.

56. ℞. Olei crotonis ʒi.
Adipis ℥i. M. fiat unguentum.

57. ℞. Kreasoti ♏v.—xxx.
Adipis ℥ss. M.

58. ℞. Camphoræ gr. xv.
Glycerini ʒss.
Adipis ℥i. M.

59. ℞. Camphoræ gr. xx.
Unguenti hydrargyri ℥ss. M.

60. ℞. Phosphori gr. ii.—v.
Ætheris q. s.
Dissolve, then add—
Camphoræ gr. xx.
Unguenti simplicis ℥ss. M.

61. ℞. Potassæ carbonatis ℥i.
Sulphuris precipitati ℥ii.
Adipis ℥iv. M.

62. ℞. Picis liquidæ ℥iv.
Ceræ flavæ ℥ss.
Sulphuris ℥i. M.

63. ℞. Cupri sulphatis gr. xxx.
Acidi sulphurici diluti ♏x.
Adipis ℥i. M.

Stimulant Gargles.

64. ℞. Tincturæ capsici ℥ss.—℥i.
Syrupi ℥i.
Aquæ rosæ ℥vi. M.

65. ℞. Vini rubri Lusitanici ℥vi.
Tincturæ capsici ℥ss. M.

66. ℞. Acidi hydrochlorici dil. ʒss.
Mellis rosæ ℥i.
Decocti hordei ℥viss. M.

67. ℞. Acidi nitro-hydrochlorici dil. ʒiii.
Decocti hordei ℥viss.
Mellis rosæ ℥i.

68. ℞. Infusi rosæ acidi ℥iiiss.
Tincturæ myrrhæ ℥ss.
Sacchari ℥ss. M. ft. gargarisma.

69. ℞. Mellis boracis ℥iss.
Aquæ ℥viss. M.

70. ℞. Mucilaginis acaciæ ℥viiss.
Olei terebinthinæ ℥ss. M.

71. ℞. Potassæ chloratis gr. c.
Acidi hydrochlorici ʒii.
Aquæ f ℥viiss.

Stimulant Enemata.

Enema assafœtidæ.

72. ℞. Olei terebinthinæ.
Tincturæ assafœtidæ ā ℥ss.
Decocti hordei Oj. M.

Enema terebinthinæ.

73. ℞. Spiritûs rectificati ℥ss.
Infusi serpentariæ ℥iiss. M.

Stimulant Powders.

74. ℞. Cupri subacetatis.
Pulvis sabinæ ana ʒi. M.

75. ℞. Pulvis sabinæ gr. c.
Aluminis usti.
Hydrargyri oxidi rubri ana gr. xv. M.

Fumigations.

76. ℞. Sulphuris ℥ss.—℥iss.
Iodinii gr. xx.—l. M.
(A twelfth part of this powder to be used at a time. The vapours of sulphur and of iodine may also be used separately, in obstinate cutaneous diseases.)

77. ℞. Calomelanos gr. xv.—xxx.

78. ℞. Manganesii binoxidi ℥i.
Sodii chloridi ℥iii.
Mix, then add—
Acidi sulphurici f ℥i.
Aquæ f ℥ii.
(Chlorine is given off from this mixture on applying heat.)

79. ℞. Hydrarg. sulphureti gr. xx.—xxx.

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4. NARCOTICS, ANODYNES, AND SEDATIVES.

(Including Antispasmodics belonging to these Classes.)

1. Æther, dose ♏xx.—ʒi.; vapor ʒj.—ʒij.
2. Acidum hydrocyanicum dilutum, dose ♏iii.—♏viii.
3. Aconiti extractum, dose gr. i.—gr. ii. Aconiti tinctura, dose ♏v.—♏xv. The doses to be cautiously increased. Aconitia (only used externally).
4. Atropiæ liquor, dose ♏iii.—v. A. sulphatis liquor, ♏iii.—v.
5. Belladonnæ extractum, dose gr. $\frac{1}{4}$—gr. i. Tinctura belladonnæ, dose ♏v.—♏xx.
6. Bismuthi carbonas gr. v.—xx.; subnitratis gr. v.—xx.; Liquor B. et ammoniæ citratis ʒss.—ʒji.; trochisci (gr. ii. subnitrate in each) i.—vj.
7. Cannabis Indicæ extractum, dose gr. $\frac{1}{4}$—gr. i.; tincturæ cannabis Indicæ ♏v.—ʒss.
8. Cerii oxalas, dose gr. i.—gr. ii.
9. Chloroformi spiritus, dose ♏xv.—ʒii.; vapor ʒj.—ʒii.
10. Colchici cormus et semen. Extractum colchici, gr. $\frac{1}{2}$—gr. ii. Extracti colchici acetici, gr. $\frac{1}{2}$—gr. ii. Vinum colchici, ♏x.—ʒss. Tinctura colchici seminum ♏x.—ʒss.
11. Conii extractum gr. v.—gr. xxx. Tinctura Conii fructûs, inert. Succus Conii, ♏xv. to ℥j.
12. Digitalis folia, gr. $\frac{1}{2}$—gr. iss. Infusum Digitalis, ʒii.—ʒiv. Tinctura Digitalis, ♏x.—ʒss. Digitalinum, gr. $\frac{1}{60}$—$\frac{1}{30}$.
13. Hyoscyami folia, dose gr. v.—gr. x. Extractum Hyoscyami, dose gr. v.—xx. Tinctura Hyoscyami, dose ♏x.—ʒi.
Lactucæ extractum, dose gr. v.—xv.
Lauro-cerasi aqua, ♏v.—xxx.
14. Lobeliæ inflatæ pulvis, dose gr. i.—gr. v. Tinctura Lobeliæ, dose ♏x.—ʒss. Tinctura Lobeliæ ætherea, dose ♏x.—ʒss.
15. Morphia, dose gr. $\frac{1}{4}$—gr. i. Morphiæ hydrochloras, dose gr. $\frac{1}{4}$—gr. i. Liquor morphiæ hydrochloratis (gr. i. in ʒii.), dose ♏xv.—ʒii. Trochisci morphiæ (gr. i. in 36 lozenges), dose 1 to 15 during the day. Trochisci morphiæ et ipecacuanhæ (gr. i. in 36 lozenges).

16. Opium, dose gr. i.—gr. vi.
Extractum opii, dose gr. $\frac{1}{2}$—gr. ii.
Enema opii (ʒss. of laudanum = gr. ii. opium, to starch f℥ii.).
Extractum opii liquidum (gr. i. of extract in about ♏xxiii.).
Pilula saponis composita (gr. i. in gr. v.), dose gr. v.—gr. x.
—— styracis composita L. (gr. i. in gr. v.), dose gr. v.—gr. x.
—— plumbi cum opio (gr. i. in viii.), dose gr. iv.—viii.
Pulvis cretæ aromaticus cum opio (gr. i. in xl.), dose gr. x.—xl.
—— kino compositus (gr. i. in xx.), dose gr. v.—xx.
—— ipecacuanhæ compositus (gr. i. in gr. x.), dose gr. v.—xv.
—— opii compositus (gr. i. in x.) gr. ii.—v.
Tinctura opii (gr. i. in ♏xv.), dose ♏v.—ʒss.
—— camphoræ composita (gr. i. in ℥ss.), dose ʒss.—f℥ss.
Trochisci morphiæ ($\frac{1}{36}$ gr. morph. hydroch. in each) i.—vj.
—— morphiæ et ipecacuanhæ ($\frac{1}{36}$ gr. and $\frac{1}{12}$ gr.) i.—vj.
—— opii (gr. i. extract in 10 lozenges), 1 to 5 during the day.
Vinum opii (gr. i. in ♏xxiii.), dose ♏v.—xl.

17. Papaveris syrupus dose, ʒi.; extractum, gr. ii.—v.
Physostigmatis extractum gr. $\frac{1}{16}$—$\frac{1}{4}$.

18. Stramonii folia et semina, dose gr. ii.—gr. x. Extractum Stramonii, dose gr. $\frac{1}{4}$—gr. iii. Tinctura Stramonii, dose ♏x.—xx.

19. Tabaci enema (tobacco gr. xx.—boiling water f℥viii.). Dose, the whole.

20. Veratria, dose gr. $\frac{1}{12}$—$\frac{1}{6}$.

Narcotics, &c., in the form of Draught.

80. ℞. Tincturæ opii ♏xx.
Aquæ cinnamomi.
Aquæ puræ āā ʒvi. M.

81. ℞. Potassæ bicarb. gr. xx.
Aquæ menthæ viridis f℥i.
Tincturæ opii ♏xxv. M.
(To be taken with ℥j. of lemon-juice.)

82. ℞. Tincturæ opii ♏xxx.
Liq. ammoniæ acetatis ʒi.
Aquæ cinnamomi.
Syrupi tolutani āā f℥ss. M.

83. ℞. Acidi sulphurici diluti ♏xv.
Tincturæ opii ♏x. vel tincturæ hyoscyami ʒss.
Tincturæ digitalis ♏x.
Infusi quassiæ ℥iss. M.

84. ℞. Acidi hydrocyanici diluti ♏v.
Misturæ amygdalæ ℥iss. M.

85. ℞. Bismuthi carbonatis gr. x.
Acidi hydrocyanici diluti ♏v.
Mucilaginis acaciæ f℥i.
Syrupi aurantii ʒi. M.

86. ℞. Acidi hydrocyanici diluti ♏v.
Tincturæ digitalis ♏x.
Aquæ camphoræ.
Aq. cinnamomi āā ʒvj. M.

87. ℞. Tincturæ belladonnæ ♏x.
Syrupi papaveris ʒj.
Spiritûs chloroformi ♏xx.
Aq. menthæ piperitæ ℥iss. M.

88. ℞. Potassæ nitratis gr. c.
Tincturæ digitalis ♏x.
Liq. ammoniæ acetatis ʒii.
Syrupi hemidesmi ʒj. M.
Aquæ destillatæ ℥iss.

89. ℞. Træ. seminis colchici ♏xv.
Infusi digitalis ʒiv.
Aquæ cinnamomi ℥iss. M.

Narcotics, &c., in the form of Pill.

90. ℞. Extracti conii gr. x.
Bismuthi subnitratis gr. v.
Fiant pilulæ duæ.

91. ℞. Extracti belladonnæ gr. $\frac{1}{2}$.
Pulvis ipecac. c. gr. x.
M. fiant pilulæ duæ.

92. ℞. Pulvis digitalis.
——— scillæ.
Ext. hyoscyami āā gr. v.
M. in pilulas tres divide.

93. ℞. Camphoræ pulvis.
Ext. hyoscyami ana gr. ii. ss.
Sp. rectificatus q. s. ft. pil.

94. ℞. Extracti hyoscyami gr. v.
Extracti conii gr. x. ft. pil. iii. M.

95. ℞. Extract. conii gr. viii.
Pulv. ipecacuanhæ gr. ii.
Morphiæ hydrochlor. gr. $\frac{1}{8}$
In pilulas duas divide.

96. ℞. Cerii oxalas gr. ii.
Extracti lactucæ gr. viii.
Fiant pilulæ duæ.

Narcotics, &c., in the form of Powder.

97. ℞. Pulv. ipecac. comp. gr. i.
Sacchari gr. xx. M.
(Divide into four powders. For young infants. Each powder contains $\frac{1}{40}$ gr. of opium.)

98. ℞. Camphoræ gr. iii.
Spirit. vin. rect. ♏ii.
Pulv. ipecac. c. gr. v. M.
(A powder to be taken at bed-time.)

Sedatives in the form of Vapour.

1. Vapor acidi hydrocyanici.
2. Vapor conii.

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5. EXTERNAL SEDATIVE APPLICATIONS.

1. Cataplasma conii.
2. Chloroformum.
3. Decoctum papaveris.
4. Emplastrum belladonnæ (Resin and B. p. æ.); opii (gr. i. of powder in gr. x.).
5. Extractum aconiti; belladonnæ; conii; opii; opii liquidum.
6. Linimentum aconiti; belladonnæ; chloroformi; opii (gr. i. in ʒss.).
7. Unguentum aconitiæ (gr. viii. in ℥i.); atropiæ (gr. viii. in ʒi.); belladonnæ (gr. lxxx. to ℥i.); gallæ cum opio (gr. i. in about gr. xiv.); veratriæ (gr. viii. in ℥i.).

Several preparations of the Pharmacopœia enumerated among narcotics and sedatives (pp. 664, *et seq.*) also admit of external application All substances, too, which produce cold by evaporation or otherwise may be said to belong to the class of sedatives.

Sedative Lotions.

99. ℞. Potassæ carbonatis gr. xii.
Tincturæ opii ♏xxx.
Aquæ ℥i. M. fiat lotio.

100. ℞. Tincturæ opii.
Acidi hydrocyanici, dil
āā partes æquales.
M. fiat lotio.

101. ℞. Liquoris potassæ ʒii.
Acid hydrocyanici dil. ℥iss.
Misturæ amygdalæ f℥viss.
M. fiat lotio.

102. ℞. Extracti belladonnæ gr. ii.
Extracti opii ana gr. ii.
Aquæ ʒi. M. fiat lotio.

103. ℞.* Potassii cyanidi gr. x.
Mist. amygdalæ ℥vi. M.
(* *Non-officinal.*)

104. ℞. Extracti conii gr. xl.
Extracti opii gr. iii.
Aquæ ferventis ʒi. M.

105. ℞. Vini opii ♏xx.
Aquæ laurocerasi ℥j. M.

Cold Applications.

106. ℞. Ammoniæ hydrochloratis,
Sodii chloridi,
Potassæ nitratis āā ℥ii.
Mix, and dissolve in water. (A frigorific mixture, applicable whenever intense cold is required.)

107. ℞. Ammoniæ nitratis.
Aquæ āā lb. i. Solve.
(In winter, mix equal parts of snow and common salt. In summer, equal parts of pounded ice and salt.)

Sedative Fomentations.

108. ℞. Opii gr. c.
Aquæ ferventis Oi. M.

109. ℞. Extracti belladonnæ gr. l.
Aquæ ferventis Oi. M.

Sedative Ointments.

110. ℞. Plumbi acetatis gr. xxx.
Acid hydrocyanici dil. ʒiii.
Unguenti simplicis ℥iii. M.

111. ℞. Potassii cyanidi gr. xii.
Olei amygdalæ ʒii.
Unguenti simplicis ℥ii. M.

Sedative Enemata and Suppositoria.

Enema opii; E. tabaci.
Suppositoria morphiæ. S. plumbi composita.

112. ℞. Pilulæ saponis co. gr. v.
Fiat suppositorium.

113. ℞. Liquoris atropiæ ♏v.
Decocti amyli ℥iij.
Fiat enema.

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6. STIMULANTS, IN COMBINATION WITH NARCOTICS, SEDATIVES, AND ANODYNES.

(Including Stimulant and Anodyne Antispasmodics.)

In the form of Draught.

114. ℞. Tr. valerianæ ammon. ʒss.
Spiritûs ætheris ʒi.
Tincturæ hyoscyami ʒss.
Aquæ camphoræ f℥i. M.

115. ℞. Tincturæ digitalis ♏xv.
Sp. ammon. comp. ʒss.
Aquæ camphoræ ℥iss. M.

116. ℞. Moschi gr. x.
Ætheris.
Tincturæ opii āā ♏xx.
Aquæ cinnamomii f ℥i. M.

117. ℞. Aquæ camphoræ ℥iii.
Spiritûs ætheris.
Tinct. camphor. compositæ.
Syrupi papav. āā ʒi. M.

118. ℞. Tinct. opii ʒss.
Mist. camphoræ f ℥i. M.

119. ℞. Tincturæ opii ♏x.
Spiritûs ætheris ♏xl.
Aquæ camphoræ ℥iss. M.

120. ℞. Tinct. colchici seminum.
Spir. ammoniæ co. āā ʒss.
Infusi serpentariæ ℥iss. M.

In the form of Pill.

121. ℞. Pil. assafœtidæ compositæ
Camphoræ ā gr. v.
Fiant pilulæ duæ.

122. ℞. Castorei gr. v.
Pil. saponis comp. gr. iii.
Olei menthæ pulegii gttj.
Fiant pilulæ duæ.

123. ℞. Camphoræ gr. v.
Olei cajuputi ♏ii.
Pulveris opii gr. ss.
Extracti hyoscyami gr. v.
Fiant pilulæ duæ.

124. ℞. Kreasoti ♏i.
Pilulæ saponis compositæ gr. iii.
Ext. hyoscyami gr. viii.
Fiant pilulæ duæ.

7. EXTERNAL APPLICATIONS (Stimulant and Sedative).

125. ℞. Linimentum opii ℥iss.

126. ℞. Olei cajuputi f ℥iss.
Tincturæ opii f ℥ss.
Lin. terebinthinæ ℥ii. M.

127. ℞. Linimenti belladonnæ.
Linimenti chloroformi partes æquales. M.

128. ℞. Tincturæ cantharidis f ℥ss.
Linimenti camphoræ f ℥i.
Liquoris ammoniæ ʒi.
Tincturæ opii ʒiii. M.

129. ℞. Olei crotonis ♏x.
Linimenti saponis co. ℥j.
Tincturæ opii f ℥ss. M.

Enemata (Stimulant and Sedative).

130. ℞. Tincturæ assafœtidæ f ℥ss.
Tincturæ opii ʒi.
Decocti hordei Oss. M.

131. ℞. Camphoræ gr. xx.
Olei terebinthinæ f ℥i.
Decocti hordei Oss. M.

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8. TONICS.

1. MINERAL.

Mineral Acids.

1. Acidum hydrochloricum dilutum	dose ♏x. to ♏xxx.
2. Acidum nitricum dilutum	,, ♏x. — ♏xxx.
3. Acidum nitro-hydrochloricum dilutum	,, ♏x. — ♏xxx.
4. Acidum phosphoricum dilutum	,, ♏x. — ♏xxx.
5. Acidum sulphuricum aromaticum	,, ♏x. — ♏xxx.
6. Acidum sulphuricum dilutum	,, ♏x. — ♏xxx.

Preparations of Iron.

7.	Ferri et ammoniæ citras	dose	gr. v.	to	gr. x.
8.	Ferri arsenias	,,	gr. $\frac{1}{16}$	—	gr. $\frac{1}{12}$.
9.	Ferri carbonas saccharata	,,	gr. x.	—	gr. c.
10.	Ferri iodidum	,,	gr. v.	—	gr. x.
11.	Ferri et quiniæ citras	,,	gr. v.	—	gr. x.
12.	Ferrum tartaratum	,,	gr. v.	—	gr. x.
13.	Ferri oxidum magneticum	,,	gr. v.	—	gr. xxx.
14.	Ferri peroxidum humidum	,,	gr. cc.	—	℥ss.
15.	Ferri peroxidum hydratum	,,	gr. v.	—	ʒj.
16.	Ferri phosphas	,,	gr. v.	—	gr. xx.
17.	Ferri sulphas	,,	gr. i.	—	gr. x.
18.	Ferri sulphas exsiccata	,,	gr. i.	—	gr. v.
19.	Ferri sulphas granulata	,,	gr. i.	—	gr. x.
20.	Ferrum redactum	,,	gr. i.	—	gr. x.
21.	Liquor ferri perchloridi	,,	♏x.	—	♏xxx.
22.	Liquor ferri pernitratis	,,	♏v.	—	♏xx.
23.	Mistura ferri aromatica	,,	ʒj.	—	℥ij.
24.	Mistura ferri composita	,,	℥j.	—	℥i.
25.	Pilula ferri carbonatis	,,	gr. v.	—	gr. xx.
26.	Pilula ferri iodidi (gr. v. = gr. i$\frac{1}{3}$ nearly FeI)	,,	gr. v.	—	gr. xx.
27.	Syrupus ferri iodidi (ʒi. = gr. ivss. FeI)	,,	ʒss.	—	ʒii.
28.	Syrupus ferri phosphatis	,,	ʒi.	—	ʒiv.
29.	Tinctura ferri acetatis	,,	♏v.	—	♏xxx.
30.	Tinctura ferri perchloridi	,,	♏x.	—	♏xxx.
31.	Trochisci ferri redacti (1 gr. in each)	,,	i.	—	vj.
32.	Vinum ferri; et v. f. citratis	,,	ʒj.	—	ʒiv.
33.	Emplastrum ferri.				

Preparations of Zinc.

34.	Zinci acetas	dose	gr. ii.	to	gr. v.
35.	Zinci carbonas	,,	gr. ii.	—	gr. v.
36.	Zinci oxydum	,,	gr. ii.	—	gr. v., or more.
37.	Zinci sulphas	,,	gr. ii.	—	gr. v., or more.
38.	Zinci valerianas	,,	gr. i.	—	gr. v.

Preparation of Copper.

39.	Cupri sulphas	dose	gr. $\frac{1}{4}$	to	gr. ii.

Preparations of Arsenic.

40. Acidum arseniosum . . . . . . dose gr. $\frac{1}{20}$ to gr. $\frac{1}{5}$.
41. Ferri arsenias . . . . ,, gr. $\frac{1}{16}$ to gr. $\frac{1}{2}$.
42. Liquor arsenicalis (gr. iv. in f ℥i., or $\frac{1}{24}$ gr. in ♏v.), dose ♏v.—x.
43. Liquor arsenici hydrochloricus (gr. iv. ASO_3. in ℥j., or $\frac{1}{24}$ in ♏v.), dose ♏ii. — ♏viii.
44. Liquor sodæ arseniatis (gr. iv. in f ℥i., or $\frac{1}{24}$ gr. in ♏v.), ♏v.—x.

Preparations of Silver.

45. Argenti oxydum . . . . dose gr. ½ to gr. i.
46. Argenti nitras . . . . ,, gr. ¼ — gr. i.

2. VEGETABLE TONICS.

Unless otherwise specified the doses are as follows:
Extractum . . . . dose gr. iii. to gr. x.
Decoctum }
Infusum } . . . . ,, f ℥ss. — f ℥ii.
Tincturæ. . . . . ,, ʒss. — ʒii.

47. Anthemidis extractum, infusum.
48. Aurantii infusum, infusum compositum, syrupus, tinctura.
49. Berberiæ sulphas—dose, gr. i. to x.
50. Calumbæ extractum, infusum, tinctura.
51. Cascarillæ infusum, tinctura.
52. Chiratæ infusum, tinctura.
53. Cinchonæ flavæ extractum liquidum (dose ʒss. to ʒiss.), decoctum, infusum, tinctura.
54. Cinchonæ (pallidæ) tinctura composita.
55. Cuspariæ infusum.
56. Gentianæ extractum, infusum compositum, tinctura.
57. Lupuli extractum, infusum, tinctura.
58. Nucis vomicæ extractum (dose gr. ½ to gr. ii.), tinctura (♏x. to ♏xx.).
59. Pareiræ extractum; extractum liquidum (dose ʒss. to ʒiss.); decoctum.
60. Quassiæ extractum, infusum.
61. Quiniæ sulphas (dose gr. i. to gr. v.) tinctura composita (dose ʒi. to ʒiv.) vinum (dose ʒss. to ʒj.)
62. Serpentariæ, infusum, tinctura.
63. Strychnia (dose gr. $\frac{1}{36}$ to gr. $\frac{1}{12}$).
64. Strychniæ liquor (♏v. gr. = $\frac{1}{24}$) dose ♏iii. to ♏x.

Tonics in the form of Draught.

132. ℞. Quiniæ disulphatis gr. ii.
Tincturæ aurantii ʒj.
Infusi rosæ acidi ℥iss. M.

133. ℞. Liquoris arsenicalis ♏v.
Infusi lupuli ℥iss. M.

134. ℞. Acidi nitrici diluti ♏xv.
Infusi anthemidis ℥iss. M.

135. ℞. Infusi aurantii ℥iss.
Træ. Serpentariæ ʒss. M.

136. ℞. Berberiæ sulphatis gr. v.
Infusi chiratæ ʒiss.

137. ℞. Infusi calumbæ ℥iss.
Acidi nitro-hydrochlorici diluti ♏xv. M.

138. ℞. Sodæ bicarbonatis gr. xx.
Tincturæ cascarillæ ʒj.
Infusi calumbæ ℥iss. M.

139. ℞. Infusi cuspariæ ℥iss.
Liq. Strychniæ ♏iv. M.

140. ℞. Infusi cascarillæ ℥j.
Tincturæ aurantii ʒj. M.

141. ℞. Infusi lupuli ℥iss.
Tincturæ nucis vomicæ ♏x. M.

142. ℞. Dec. cinchonæ flavæ ℥iss.
Acid sulphurici dil. ♏xx. M.

143. ℞. Infusi lupuli ℥iss.
Extr. pareiræ liquidi ʒj.
Acidi hydrochlorici diluti ♏x. M.

144. ℞. Træ. ferri perchloridi ♏xv.
Infusi quassiæ ℥iss. M.

145. ℞. Ferri et quiniæ citratis gr. v.
Syrupi aurantii floris ʒj.
Aquæ cinnamomi ℥iss. M.

146. ℞. Ferri tartarati gr. v.
Infusi quassiæ ℥iss. M.

147. ℞. Ferri et ammoniæ citratis gr. x.
Spiritûs ammoniæ arom. ʒss.
Aq. menthæ pip. ℥iss. M.

148. ℞. Ferri iodidi gr. v.
Spiritûs myristicæ ʒss.
Aquæ menth. puleg. ℥iss. M.

149. ℞. Ferri sulphatis gr. iii.
Magnesiæ sulphatis ʒss.
Acidi sulphurici dil. ʒss.
Aq. menth. pip. ℥iss. M.

150. ℞. Acidi phosphorici dil. ℥ij.
Syrupi aurantii ℥j.
Aquæ f ℥xix. M. (To be used as a common drink.)

Tonics in the form of Pills.

151. ℞. Cupri sulphatis gr. ¼.
Pilulæ saponis co. gr. ii.
Micæ panis gr. ii. ft. pil.

152. ℞. Zinci valerianatis gr. ii.
Extracti lupuli gr. iii.
M. Fiat pilula.

153. ℞. Ferri sulphatis exsiccatæ gr. v.
Extracti anthemidis gr. v.
Fiant pilulæ duæ.

154. ℞. Quiniæ disulphatis gr. j.
Extracti gentianæ gr. iv. M.

155. ℞. Argenti oxidi gr. i.
Extr. gentianæ gr. iv. M.

156. ℞. Argenti nitratis gr. ½.
Extr. hyoscyami gr.iv. M.

157. ℞. Bismuthi subnit. gr. x.
Conf. rosæ gal. q.s. ft. pil.ii.

Tonics in the form of Powder.

158. ℞. Ferri redacti gr. iii.
Pulvis cinnam. co. gr. v.
Mix for a powder.

159. ℞. Ferri carbonatis saccharatæ gr. x.
Pulveris cinnam. co. gr. v.
Mix for a powder.

160. ℞. Ferri phosphatis gr. iii.
Pulveris cinnam. co. gr. v.
Mix for a powder.

161. ℞. Ferri oxidi magnetici gr. iii.
Pulvis cinnam. co. gr. v.
Mix for a powder.

9. ASTRINGENTS.

(*a.*) *Mineral.*

1.	The mineral acids	
2.	Alumen	dose gr. x. to gr. c.
3.	Alumen exsiccatum	,, gr. v. — gr. xv.
4.	Argenti nitras	,, gr. ¼ — gr. i.
5.	Cadmii iodidi, et unguentum (used externally).	
6.	Misturæ cretæ	,, ℥i. — ℥ii.
7.	Cupri sulphas	,, See Tonics, p. 669.
8.	Ferri perchloridi, liquor et tinctura	
	,, pernitratis liquor	
	,, sulphas exsiccata, et granulata	
9.	Plumbi acetas	,, gr. i. — gr. v.
10.	Zinci acetas, sulphas	,, gr. ii. — gr. v.

(*b.*) *Vegetable.*

1.	Belæ extractum liquidum	dose ʒi. — ʒii.
2.	Catechu, pallidum	,, gr. x. — gr. xxx.
3.	,, pulvis compositus	,, gr. v. — gr. xxx.
4.	,, tinctura	,, ʒss. — ʒii.
5.	,, infusum	,, ℥i. — ℥ii.
6.	,, trochisci	,, ii. — xx.
7.	Cinchona pallida	,, gr.xxx.— gr. c.
8.	Cinchonæ tinctura composita	,, ʒss. — ʒii.
9.	Granati radicis decoctum	,, ℥i. — ℥ii.
10.	Hæmotoxyli decoctum	,, ℥i. — ℥ii.
11.	Hæmatoxyli extractum	,, gr. x. — ʒss.
12.	Kino pulvis compositus (1 gr. opium in gr. xx.)	,, gr. v. — gr. xx.
13.	Kino tinctura	,, ʒss. — ʒii.
14.	Krameriæ extractum	,, gr. v. — x.
15.	Krameriæ infusum	,, ℥iss. — ℥ii.
16.	Krameriæ tinctura	,, ℥ss. — ℥ii.
17.	Kreasotum	,, ♏i. — ♏iii.
18.	Kreasoti mistura	,, ℥i. — ℥ii.
19.	Maticæ infusum	,, ℥ss. — ℥iv.
20.	Pterocarpi lignum.	
21.	Lavendulæ tinctura composita	,, ʒss. — ʒii.
22.	Quercûs decoctum	,, ℥i. — ℥ii.
23.	Gallæ pulvis	,, gr. x. — ʒ ss.
24.	Gallæ tinctura	,, ʒ ss. — ʒii.
25.	Acidi tannici trochisci	,, ii. — xx.
26.	Acidi tannici suppositoria	,, gr. x. — gr. xxx.
27.	Acidum gallicum, et tannicum	,, gr. i. — gr. v.
28.	Acidi gallici et tannici glycyrinum	,, ♏x. — ♏xxx.
29.	Rosæ (Gallicæ) infusum acidum	,, ℥i. — ℥ii.

30.	Rosæ (Gallicæ) confectio	dose ʒss.	to ʒii.
31.	Rosæ (Gallicæ) syrupus	„ ʒss.	— ʒii.
32.	Rosæ caninæ confectio	„ ʒss.	— ʒii.
33.	Ulmi decoctum	„ f ℥ii.	— f ℥iv.
34.	Uvæ ursi, infusum	„ f ℥i.	— ʒii.

(*c.*) *Mineral and Vegetable.*

1.	Pilula plumbi cum opio	dose gr. ii.	to gr. viii.
2.	Pulvis cretæ aromaticus	„ gr. x.	— gr. xxx.
3.	Pulvis cretæ aromaticus cum opio	„ gr. x.	— gr. xx.

Astringents in the form of Mixture or Draught.

162. ℞. Aluminis gr. x.
Syrupi ʒj.
Infusi rosæ acidi ℥iss. M.

163. ℞. Acidi sulph. diluti f ʒss.
Infusi rosi acidi f ℥vi.
Syrupi rhæados f ℥ii.
Aquæ destillatæ f ℥xii.
(To be used as a common drink.)

164. ℞. Acidi nitro-hydrochlorici diluti ♏xv.
Tincturæ kino ʒi.
Infusi uvæ ursi ℥iss. M.

165. ℞. Misturæ cretæ ℥j.
Syrupi papaveris ʒj. M.

166. ℞. Pulvis cinnam. co. gr. xx.
Tincturæ opii ♏v.
Misturæ cretæ ℥iss. M.

167. ℞. Træ ferri perchloridi ʒss.
Infusi quassiæ ℥iss. M.

168. ℞. Liquoris ferri pernitratis ♏xv.
Syrupi aurantii floris ʒj.
Aquæ ℥iss. M.

169. ℞. Extracti belæ liquidi ʒj.
Infusi cuspariæ ℥iss. M.

170. ℞. Tincturæ cinchonæ compositæ ʒj.
Infusi uvæ ursi ℥iss. M.

171. ℞. Træ. lavandulæ compositæ ʒj.
Infusi krameriæ ℥iss. M.

172. ℞. Syrupi rosæ Gallicæ ʒj.
Infusi catechu ℥iss. M.

173. ℞. Acidi gallici gr. v.
Tincturæ opii ♏v.
Infusi rosæ acidi ℥iss. M.

174. ℞. Tincturæ krameriæ ʒj.
Decoct. hæmatoxyli ℥iss. M.

Astringents in the form of Pill.

175. ℞. Pilulæ plumbi cum opii gr. iii.—gr. v.

176. ℞. Acidi gallici gr. iii.
Plumbi acetatis gr. i.
Conf. rosæ Gal. q. s. ut fiat pil.

177. ℞. Acidi gallici gr. iiss.
Morphiæ gr. $\frac{1}{16}$.
Confectionis rosæ Gallicæ quantum sufficit ut ft. pil.

178. ℞. Plumbi acetatis gr. i.
Pilulæ saponis compositæ gr. ii. fiat pilula.

179. ℞. Zinci sulphatis gr. ii.
Pulvis opii gr. $\frac{1}{4}$.
Extracti rhei gr. iii.
Fiat pil.

See also Formulæ, p. 671.

Astringents in the form of Powder.

180. ℞. Pulv. cinchonæ pallid. gr. xl.
Acidi gallici gr. ii.
Misce. et fiat pulvis.

181. ℞. Pulvis cretæ aromatici cum opio gr. x.
Pulv. catechu comp. gr. x.
M.

Astringent Lotions.

182. ℞. Argenti nitratis gr. ii.–xl.
Aquæ destillatæ ℥i. Solve.

183. ℞. Liquoris calcis ℥i.
Olei olivæ ℥ii. M.

184. ℞. Cupri sulphatis gr. iii.–xl.
Aquæ camphoræ ℥i. S.

185. ℞. Acidi tannici gr. x.
Acidi hydrochlorici dil. ʒss.
Aquæ ℥i. Solve.

186. ℞. Liquoris plumbi subacetatis ♏xx.
Glycyrini ʒi.
Aquæ rosæ ʒvii. Misce.

187. ℞. Liq. plumbi subacet. ʒss.
Spiritûs rectificati ♏xxx.
Aquæ destillatæ ʒvii.

188. ℞. Zinci chloridi gr. i.
Aquæ ℥i. Solve.

189. ℞. Zinci sulphatis gr. v.
Tincturæ lavendulæ compositæ ♏xxx.
Aquæ ℥i. Solve.

190. ℞. Zinci sulphatis gr. i. to x.
Aquæ rosæ ℥i. Solve.

Astringent Injections.

191. ℞. Aluminis gr. c.
Decocti quercûs Oi. S.

192. ℞. Cupri sulphatis gr. ii.—v.
Aquæ ℥i. S. et fiat injectio.

193. ℞. Liq. ferri perchloridi ♏iii.
Aquæ ℥i. M. et ft. injectio.

194. ℞. Liq. plumb. subacet. ♏x.
Extracti opii liquidi ʒss.
Aquæ destillatæ ℥i. M.

195. ℞. Zinci sulphatis
Aluminis ana gr. ii.
Aquæ ℥i. Solve.

Astringent Collyria.

196. ℞. Aluminis gr. iii. to gr. x.
Aquæ ℥i. Solve.

197. ℞. Argenti nitratis gr. i.—v.
Aquæ destillatæ f ℥i.

198. ℞. Cupri sulphatis gr. i.—v.
Aquæ ℥i. Fiat collyrium.

199. ℞. Hydrargyri perchlor. gr. $\frac{1}{20}$.
Aquæ ℥i. S. Ft. collyrium.

200. ℞. Plumbi acetatis gr. ii.
Aquæ destillate ℥i. S.

201. ℞. Zinci sulphatis gr. i.—v.
Vini opii ʒi.
Aquæ ʒvii. Fiat collyrium.

Astringent Gargles.

202. ℞. Aluminis ʒi.
Acidi sulphurici arom. ʒss.
Tincturæ myrrhæ ʒii.
Decocti cinchonæ ℥vi. M.

203. ℞. Acidi tannici gr. c.
Spiritûs rectificati ℥ss.
Aquæ camphoræ ℥vss. M.

Astringent Ointments.

204. ℞. Argenti nitratis gr. xx.
Adipis ℥i. M. Fiat unguentum.

205. ℞. Acidi sulphurici ʒss.
Adipis ℥i. Ft. unguentum.

206. ℞. Cretæ precipitatæ ℥i.
Olei olivæ ʒi.
Adipis ℥ss. Misce.

207. ℞. Cupri sulphatis gr. xxx.
Adipis ℥i. M.

208. ℞. Hydrargyri perchlor. gr. v.
Adipis ℥i. M.

209. ℞. Liq. plumbi subacet. ʒj.
Adipis ℥i. Misce.

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10. DEPRESSENTS.

1.	Acidum hydrocyanicum dilutum	dose	♏ii.	to ♏viii.
2.	Antimonii oxidum	,,	gr. i.	— gr. v.
3.	Antimonium sulphuratum	,,	gr. i.	— gr. v.
4.	Antimonium tartaratum	,,	gr. $\frac{1}{8}$	— gr. $\frac{1}{2}$.
5.	Antimoniale vinum (gr. i. in ℥ss.)	,,	ʒss.	— ʒii.
6.	Antimonialis pulvis (i gr. terox. in iii grs.)	,,	gr. iii.	— gr. xv.
7.	Colchici seminis tinctura	,,	♏xx.	— ʒi.
8.	Colchici extractum	,,	gr. i.	— gr. iii.
9.	Colchici extractum aceticum	,,	gr. i.	— gr. iii.
10.	Colchici vinum	,,	♏xx.	— ʒii.
11.	Digitalis infusum	,,	ʒii.	— ʒiv.
12.	Digitalis tinctura	,,	♏x.	— ʒss.
13.	Digitalinum	,,	gr. $\frac{1}{60}$	— $\frac{1}{30}$.
14.	Ipecacuanhæ pulvis	,,	gr. v	— gr. x.
15.	Ipecacuanhæ vinum	,,	♏xv.	— ʒi.
16.	Lobeliæ tinctura	,,	♏xx.	— ʒi.
17.	Lobeliæ tinctura ætherea	,,	♏xx.	— ʒi.
18.	Scillæ syrupus	,,	ʒi.	— ʒii.
19.	Scillæ tinctura	,,	ʒss.	— ʒi.
20.	Tabaci enema	,,	℥iv.	— ℥viii.
21.	Veratri viridis pulvis	,,	gr. i.	— gr. iii.
22.	Veratri viridis tinctura	,,	♏v.	— ♏xx.

It must be borne in mind that these are *depressent* doses.

Depressents in the form of Draught or Mixture.

210. ℞. Vini antimonialis ʒss.
Aquæ destillatæ ℥ss. M.

211. ℞. Vini colchici ʒj.
Aquæ camphoræ ℥iss. M.

212. ℞. Tr. veratri viridis ♏xv.
Aquæ anethi ℥iss. M.

213. ℞. Tincturæ digitalis ♏xv.
Aquæ cinnamomi ℥iss. M.

214. ℞. Acid. hydrocyanici dil. ♏v.
Misturæ amygdalæ ℥iss. M.

215. ℞. Vini ipecacuanhæ ♏xv.
Aquæ cinnamomi ℥iss. M.

Depressents in the form of Powder.

216. ℞. Antimonii tartarati gr. i.
Sacchari albi gr. xxxi. M.
(Divide into parts proportioned to the age, and give one, three, or four times a day.)

217. ℞. Antimonii tartarati gr. i.
Hydrargyri c. cretâ gr. xii.
Sacchari albi ʒi. Misce, et in pulveris octo divide, sumat unam quartis horis.

11. EMETICS.

There are two classes of emetics; the one consisting of stimulants, the other of depressents. A certain dose of either class of substances will excite vomiting. The following formulæ comprise medicines of both classes:—

218. ℞. Vini antimonialis ℥ss.

219. ℞. Vini ipecacuanhæ ℥ss.

220. ℞. Pulvis ipecacuanhæ gr. xx.
Vini antimonialis ℥ss.
Aquæ menthæ piperitæ ʒx. M. fiat haustus.

221. ℞. Zinci sulph. gr. xx. to xl.
Aquæ cinnamomi ℥iss. M.

222. ℞. Cupri sulphatis gr. x.
Aquæ ℥iss. Ft. h.

223. ℞. Sinapis pulvis ℥ss.
Aquæ ℥iv.
(In cases of poisoning.)

224. ℞. Ammoniæ carbonatis.
Pulvis ipecacuanhæ gr. xx.
Tincturæ capsici ʒii.
Aquæ menthæ piperitæ f ℥ii. M.
(When the sensibility of the stomach is impaired, as in poisoning with opium.)

225. ℞. Tabaci foliorum ℥i.
Aquæ tepidæ q. s.
Bruise the leaves and apply the poultice to the epigastrium. (Must be removed as soon as sickness takes place.)

12. DIAPHORETICS.

There are also two classes of diaphoretics; the one consisting of stimulants, the other of depressents. Both classes are comprised in the following formulæ:—

Diaphoretics in the form of Draught.

226. ℞. Liquoris ammoniæ acetatis ʒiii.
Aquæ camphoræ ℥iss. M.

227. ℞. Potassæ nitratis gr. xx.
Vini antimonialis ʒss.
Liq. ammoniæ acet. ʒii.
Aq. menthæ pip. ℥iss. M.

228. ℞. Ammoniæ carbonatis gr. x.
Spiritûs chloroformi ʒj.
Aquæ ℥iss. M.

229. ℞. Spiritûs ætheris nitrosi ʒi.
Liq. ammoniæ acet. ʒii.
Syrupi hemidesmi ʒj.
Aq. ℥iss. M.

230. ℞. Potassæ nitratis ʒss.
Tincturæ opii ♏xv.
Mist. amygd. ℥iss. M.

231. ℞. Tr. guaiaci ammon. ʒjss.
Tincturæ opii ♏v.
Aquæ pimentæ ℥iss. M.

Diaphoretics in the form of Powders.

232. ℞. Pulvis ipecacuanhæ gr. x.
233. ℞. Pulv. ipecacuanhæ co. gr. x.
Antimonii tartarati, gr. $\frac{1}{6}$. M.

234. ℞. Pulvis ipecacuanhæ gr. i.
Pulvis antimonialis gr. x.
Sacchari gr. vi. M.

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13. EXPECTORANTS.

There are also two classes of expectorants; the one stimulant, the other depressent. Expectorants of both classes are to be found in the following preparations and formulæ:—

1.	Acidum benzoicum	dose	gr. v.	to gr. xxx.
2.	Ammoniacum	,,	gr. v.	— gr. c.
3.	Ammoniaci mistura	,,	℥ss.	— ℥iss.
4.	Antimonium tartaratum	,,	gr. $\frac{1}{6}$	— gr. $\frac{1}{4}$.
5.	Balsamum Peruvianum	,,	ʒi.	— ʒii.
6.	Balsamum tolutanum	,,	ʒi.	— ʒii.
7.	Benzoinum	,,	gr. xx.	— gr. l.
8.	Benzoini composita tinctura (Friar's balsam)	,,	ʒss.	— ʒii.
9.	Galbanum	,,	gr. x.	— gr. l.
10.	Ipecacuanhæ pulvis	,,	gr. i.	— gr. v.
11.	Ipecacuanhæ vinum	,,	♏x.	— ʒss.
12.	Ipecacuanhæ pulvis composita	,,	gr. ii.	— gr. v.
13.	Lobelia inflata	,,	gr. i.	— gr. v.
14.	Lobeliæ tinctura	,,	♏x.	— ʒss.
15.	Lobeliæ ætherea tinctura	,,	♏x.	— ʒss.
16.	Scillæ pilula composita	,,	gr. v.	— gr. x.
17.	Scillæ syrupus	,,	ʒi.	— ʒii.
18.	Scillæ tinctura	,,	♏x.	— ʒss.
19.	Senegæ infusum	,,	℥i.	— ℥ii.
20.	Senegæ tinctura	,,	ʒi.	— ʒii.
21.	Tinctura tolutana	,,	♏xx.	— ♏xl.
22.	Vinum antimoniale	,,	ʒss.	— ʒi.

Expectorants in the form of Draughts.

235. ℞. Ammon. carbonatis gr. v.
Spiritûs chloroformi ʒss.
Decocti senegæ ℥iss. M.

236. ℞. Balsami Peruviani ʒss.
Glycyrini * ʒj.
Mist. amygdalæ ℥jss. M.

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* This is commonly but wrongly spelt "Glycerine."

237. ℞. Ammoniæ carbonatis.
Ammon. benzoatis ā gr. v.
Vini ipecacuanhæ ♏x.
Decocti senegæ ℥iss. M.

238. ℞. Vini ipecacuanhæ ♏x.
Syrupi papaveris ʒj.
Spiritûs ammon. arom. ʒss.
Aquæ camphoræ ℥iss. M.

239. ℞. Syrupi scillæ f ʒss.
Misturæ ammoniaci ℥iss. M.

240. ℞. Balsami copaibæ ʒss.
Vitelli ovi ʒj.
Aquæ cinnamomi ℥iss.
Fiat emulsio.

241. ℞. Liquoris ammoniæ acetatis ʒiii.
Syrupi scillæ ʒi.
Decocti senegæ ℥j. M.

242. ℞. Træ. lobeliæ æthereæ ʒss.
Tincturæ scillæ ʒss.
Aquæ camphoræ ℥jss. M.

243. ℞. Vini antimonialis ♏xl.
Liquoris ammon. acet. ʒi.
Oxymellis scillæ ʒj.
Aquæ pimentæ ℥i. M.

244. ℞. Vini ipecacuanhæ ♏xl.
Potassæ bicarbonatis gr. xx.
Aquæ ℥iss. M. (to be taken with a table-spoonful of lemon-juice.)

Expectorants in the form of Pills.

245. ℞. Pilulæ scillæ co. gr. v.
Fiat pilula.

246. ℞. Pil. ipecacuanhæ cum. scillâ gr. v. Fiat pil.

247. ℞. Antimonii tartarati gr. $\frac{1}{8}$.
Pulv. ipecacuanhæ co. gr. viii.
Mucilagicis acaciæ gr. ii.
Fiant pilulæ duæ.

248. ℞. Pilulæ scillæ compositæ.
Extracti conii āā gr. v.
Fiant pilulæ duæ.

DEMULCENTS.

1. Acaciæ gummi. Mucilago Acaciæ.
2. Amygdalæ (dulces). Pulvis amygdalæ compositus. Mistura amygdalæ. Oleum amygdalæ. Oleum olivæ. Cetaceum. Manna. Lac.
3. Amyli mucilago.
4. Decoctum hordei, cetrariæ, ulmi.
5. Glycyrrhizæ radix. Pulvis glycyrrhizæ. Extractum glycyrrhizæ.
6. Glycyrinum.
7. Lini semen. Infusum lini.
8. Mel.
9. Rosæ caninæ confectio.
10. Syrupus floris aurantii, hemidesmi, mori, rhœados, tolutanus.
11. Tragacantha. Mucilago tragacanthæ. Pulvis tragacanthæ compositus.

Demulcents in the form of Draught.

249. ℞. Cetacei gr. c.
Vitelli ovi ʒj.
Syrupi tolutani.
Aquæ cinnam. ā ʒj.
Aquæ ℥i. M.

250. ℞. Mannæ optimæ gr. c.
Infusi lini Oii. M.

251. ℞. Mucilaginis tragacanthæ.
Lactis vaccini ana ℔i.
Sacchari ℥i. M.

252. ℞. Syrupi hemidesmi ℥ii.
Decocti hordei ℥xviii. M.

253. ℞. Decocti cetrariæ ℥xviii.
Syrupi mori ℥ii. M.

254. ℞. Decocti ulmi ℥xviii.
Confec. rosæ caninæ ℥ii.
M.

255. ℞. Misturæ amygdalæ ℥xvi.
Glycyrini ℥iv. Mix.

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15. EMOLLIENTS.

1. Decoctum papaveris.
2. Cataplasma lini, fermenti.
3. Glycyrinum.
4. Oleum amygdalæ, lini, olivæ.
5. Unguentum cetacei, simplicis.
6. Cera alba.
7. Sapo, linimentum saponis, linimentum calcis, emplastrum saponis.

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16. LAXATIVES, APERIENTS, CATHARTICS, ENEMATA.

1.	Aloe. Barbadensis	dose gr. v. to gr. x.
2.	„ Decoctum aloes compositum	„ ℥ss. — ℥ii.
3.	„ Enema	„ ℥x. — ℥xx.
4.	„ Extractum	„ gr. v. — gr. x.
5.	„ Extractum. Barb. et Socot.	„ gr. v. — gr. x.
6.	„ Pilula	„ gr. v. — gr. x.
7.	„ Socotrina	„ gr. v. — gr. x.
8.	„ Tinctura aloes	„ ʒj. — ℥i.
9.	„ Vinum aloes	„ ʒii. — ʒvi.
10.	Amygdalæ oleum	„ ℥i. — ℥ii.
11.	Cambogia	„ gr. ii. — gr. v.
12.	Colocynthis. Extractum colocynthidis compositum	„ gr. v. — gr. x.
13.	Pilula colocynthidis composita	
14.	Pilula colocynthidis et hyoscyami	
15.	Crotonis oleum	„ ♏i. — ♏iii.
16.	Elaterium	„ gr. $\frac{1}{10}$ — gr. i.
17.	Extractum colocynthidis compositum	„ gr. v. — gr. x.
18.	Fel bovinum purificatum	„ gr. v. — gr. x.
19.	Fici pulpa	„ ℥ss. — ℥i.
20.	Hydrargyrum: Calomelas	„ gr. i. — gr. x.
21.	Hydrargyrum cum cretâ	„ gr. i. — gr. v.
22.	Jalapæ pulvis	„ gr. v. — gr. xx.

23.	Jalapæ Extractum	dose gr. v. to gr. x.
24.	„ Pulvis compositus (gr. v. in gr. xv.)	„ gr. xv.— gr. l.
25.	„ Pulvis scammonii compositus (about gr. v. in gr. xv.)	„ gr. x. — gr. xx.
26.	„ Resina	„ gr. v. — gr. x.
27.	„ Tinctura	„ ʒi. — ʒii.
28.	Magnesia, et magnesia levis	„ gr. xx. — gr. l.
29.	Magnesiæ carbonas, et carbonas levis	„ gr. xx. — gr. l.
30.	Magnesiæ carbonatis liquor	„ ℥j. — ℥ij.
31.	Magnesiæ sulphas	„ gr. l. — ℥ss.
32.	Magnesiæ sulphatis enema	„ ℥xvii.
33.	Manna	„ gr. l. — ℥i.
34.	Pilula aloes et assafœtida	„ gr. v. — gr. x.
35.	Pilula aloes et myrrhæ	„ gr. v. — gr. x.
36.	Pilula calomelanos composita	„ gr. v. — gr. x.
37.	Pilula cambogia composita	„ gr. v. — gr. x.
38.	Pilula hydrargyri	„ gr. v. — gr. x.
39.	Pilula rhei composita	„ gr. v. — gr. x.
40.	Podophylli pulvis	„ gr. x. — gr. xx.
41.	Podophylli resina	„ gr. $\frac{1}{4}$ — gr. i.
42.	Potassæ sulphas	„ gr. c. — gr. cc.
43.	Potassæ tartras	
44.	Potassæ tartras acida	„ gr. l. — gr. c.
45.	Pruni pulpa	„ ℥ss. — ℥i.
46.	Rhamni succus	„ ʒss. — ʒj.
47.	Rhamni syrupus	„ ʒj.
48.	Rhei extractum	„ gr. x. — gr. xx.
49.	Rhei infusum	„ ℥i. — ℥iv.
50.	Rhei pilula composita	„ gr. v. — gr. x.
51.	Rhei pulvis	„ gr. xv. — gr. l.
52.	Rhei pulvis compositus	„ gr. xxx— gr. cc.
53.	Rhei syrupus	„ ʒi. — ʒiv.
54.	Rhei tinctura	„ ʒii. — ℥i.
55.	Ricini oleum	„ ʒii. — ℥i.
56.	Scammoniæ radicis pulvis	„ gr. x. — gr. xx.
57.	Scammoniæ resina	„ gr. x. — gr. v.
58.	Scammonii confectio	„ gr. xx.— gr. l.
59.	„ mistura	„ ℥i. — ℥ii.
60.	„ pulvis compositus (gr. iv. in gr. viii.)	„ gr. x. — gr. xx.
61.	———— Extractum colocynthidis compositum	„ gr. v. — gr. x.
62.	———— Pilula colocynthidis composita	„ gr. v. — gr. x.
63.	———— Pilula colocynthidis, et hyoscyami	„ gr. v. — gr. x.
64.	Scammonium	„ gr. v. — gr. x.
65.	Senna, Alexandrina, et Indica.	
66.	Sennæ confectio	„ gr. l. — ccc.
67.	Sennæ infusum	„ ℥i. — ℥ii.
68.	Sennæ syrupus	„ ʒj. — ʒiv.

69. Sennæ tinctura	dose ʒj.	to	ʒiv.
70. Sodæ et potassæ tartras	„ gr. c.	—	℥ss.
71. Sodæ sulphas	„ gr. cc.	—	℥j.
72. Sodii chloridum	„ gr. c.	—	℥ss.
73. Sulphur, precipitatum et sublimatum	„ gr. cc.	—	℥ss.
74. Terebinthinæ enema	„ ℥xvi.		
75. Terebinthinæ oleum	„ ℥ss.	—	℥ii.

Laxatives, Aperients, Cathartics, in the form of Draught.

256. ℞. Potassæ tartratis gr. c.
Decocti aloes comp. f ℥iss.
M.

257. ℞. Olei amygdalæ ℥ii.
Olei cinnamomi ♏i.
Vitelli ovi unius.
Sacchari albi gr. c.
Muclig. acaciæ ℥iss.
M. fiat emulsion.
(One half for a dose.)

258. ℞. Olei crotonis ♏i.
Olei ricini f ℥i. Ft. h.

259. ℞. Magnesiæ sulphatis gr. cc.
Mannæ gr. l.
Infusi sennæ ℥iss. Ft. h.

260. ℞. Pulvis rhei gr. x.
Potassæ tartratis ℥ss.
Infusi sennæ ℥iss.
Tincturæ sennæ ʒii. Ft. b.

261. ℞. Sodæ et potassæ-tart. ℥ss.
Magnesiæ gr. x.
Aq.menthæ pip.℥iss. Ft.h.

262. ℞. Magnesiæ carbonatis gr. x.
Magnesiæ sulphatis gr. l.
Tincturæ zingiberis ♏xv.
Aquæ menthæ piperitæ ℥iss. Fiat haustus.

263. ℞. Tincturæ cardamomi compositæ ʒii.
Magnesia carbonatis gr. x.
Infusi rhei ℥iss. Ft. h.

264. ℞. Infusi rosæ acidi ℥iss.
Magnesiæ sulphatis gr. c.
Syrupi rosæ ʒj. M.

265. ℞. Potassæ tartratis gr. c.
Mannæ gr. lx.
Aquæ pimentæ ℥iss.

266. ℞. Olei ricini.
Olei terebinthinæ.
Mucil. acaciæ āā ℥ss. M.

267. ℞. Tincturæ sennæ ʒii.
Vini aloes ʒii.
Syrupi zingiberis ʒi.
Aq. menthæ pip. ℥iss. M.

268. ℞. Radicis armoraciæ contusæ ℥ii.
Seminis sinapis.
Radicis valerianæ āā gr. c.
Radicis rhei incisæ ʒss.
(Infuse in Oiss. of port wine. A wine-glassful as a warm aperient.)

269. ℞. Olei ricini ℥ss.
Vitelli ovi unius.
Aq. menthæ viridis ℥j.
Syr. aurantii ℥j. M.

Laxatives, Aperients, Cathartics, in the form of Pills.

270. ℞. Aloes extracti Barbadensis.
Pulvis zingiberis āā gr.iiss.
Extracti anthemidis gr. v.
Fiant pilulæ duæ.

271. ℞. Extracti aloes Socotrinæ.
Saponis duri ā gr.v. Ft.p.ii.

272. ℞. Pil. aloes et myrrhæ gr. vi.
Pulvis capsici gr. ii. Ft. p. ii.

273. ℞. Extr. colocynthidis comp.
Extr. gentianæ ā gr. iiss.
Fiat pilula.

274. ℞. Calomelanos gr. i.
Pil. coloc. et hyos. gr. viii.
Olei anethi ♏i.
In pilulas duas divide.

275. ℞. Extr. colocynth. comp.
Calomelanos āā gr. v.
Fiant pil. duæ.

276. ℞. Resinæ scammoniæ.
Calomelanos.
Ext. colocynthidis comp.
Extracti jalapæ ā gr. ijss.
Olei carui quantum suf.
Fiant pilulæ duæ.

277. ℞. Ext. colocynthidis comp.
Resinæ jalapæ.
Gambogiæ ana gr. iiss.
Resinæ podophylli gr. ¼
Olei juniperi q.s.
Fiant pilulæ duæ.

278. ℞. Olei crotonis ♏i.
Pulvis aloes q. s. M. Ft. pil.

279. ℞. Resinæ podophylli gr. ss.
Extr. anthemidis gr. viii.
Fiant pilulæ duæ.

280. ℞. Pilulæ hydrargyri gr. iii.
Extracti colocynthidis compositi gr. vii. M. Ft. pil. ii.

Laxatives, &c., in the form of Powder.

281. ℞. Pulvis jalapæ comp. gr. xl. Fiat pulvis.

282. ℞. Pulv. rhei comp. ʒj. Ft. p.

283. ℞. Pulvis rhei gr. xx.
Potassæ bitartratis gr. l.
Pulvis aromatici gr. v. M.

284. ℞. Pulvis rhei gr. x.
Calomelanos gr. iii.
Pulveris aromatici gr. v. M.

285. ℞. Pulv. scammoniæ co. gr. x.
Calomelanos gr. v. M.

Laxatives, &c., in the form of Electuary.

286. ℞. Confectio sulphuris gr. c.
Pulveris cinnam. co. gr. xx. M.

287. ℞. Confec. scammonii gr. xxx.
Resinæ podophylli gr. ¼. M.

PURGATIVE ENEMATA.

1. Enema aloes.
2. Enema magnesiæ sulphatis.
3. Enema terebinthinæ.
4. Enema assafœtidæ.

288. ℞. Infusi anthemidis f ℥x.
Sodæ sulphatis ℥i. M.

289. ℞. Ext. colocynthidis co. gr. xl.
Infusi sennæ ℥xii. M.

290. ℞. Ext. aloes Socotrinæ gr. xl.
Lactis communis f ℥vi. M.

291. ℞. Decocti hordei ℥x.
Ovi vitelli unius.
Olei ricini ℥i. Ft. enema.

292. ℞. Sodii chloridi ℥ii.
Decocti hordei Oi. M.
Fiat enema.

17. DIURETICS.

(*a.*) *Saline.*

1.	Ammoniæ acetatis liquor	dose ʒii.	to ʒvj.
2.	Ammoniæ benzoas	,, gr. x.	— gr. xx.
3.	Lithiæ carbonas	,, gr. iii.	— gr. viii.
4.	Lithiæ citras	,, gr. v.	— gr. xv.
5.	Potassæ carbonas	,, gr. x.	— gr. xxx.
6.	Potassæ acetas	,, gr. x.	— gr. l.
7.	Potassæ bicarbonas	,, gr. x.	—
8.	Potassæ chloras	,, gr. x.	— gr. xx.
9.	Potassæ citras	,, gr. xxx.	— gr. l.
10.	Potassæ liquor	,, ♏xv.	— ♏lx.
11.	Potassæ nitras	,, gr. x.	— gr. l.
12.	Potassæ tartras acida	,, gr. xxx.	— gr. c.
13.	Potassæ tartras	,, gr. xxx.	— gr. c.
14.	Sodæ liquor	,, ♏xv.	— ♏l.
15.	Sodæ acetas	,, gr. xxx.	— gr. c.
16.	Sodæ bicarbonas	,, gr. x.	— gr. l.
17.	Sodæ citro-tartras effervescens	,, gr. lx.	— gr. cc.
18.	Sodæ et potassæ tartras (Startarata)	,, gr. c.	— gr. ccl.

(*b.*) *Vegetable.*

19.	Ætheris nitrosi spiritus	dose ʒss	— ʒ ii.
20.	Armoraciæ spiritus compositus	,, ʒj.	— ʒii.
21.	Buchu infusum	,, f ℥i.	— f ℥ii.
22.	Buchu tinctura	,, ʒss.	— ʒij.
23.	Copaiba	,, ♏xx.	— ʒss.
24.	Copaibæ oleum	,, ♏iii.	— ♏xx.
25.	Cubebæ pulvis	,, gr. xx.	— gr. l.
26.	Cubebæ oleum	,, ♏iii.	— ♏xx.
27.	Digitalinum	,, gr. $\frac{1}{60}$	— gr. $\frac{1}{30}$.
28.	Digitalis pulvis	,, gr. $\frac{1}{2}$	— gr. iss.
29.	Digitalis infusum	,, ʒii.	— ʒiv.
30.	Digitalis tinctura	,, ♏x.	— ♏xxx.
31.	Juniperi oleum	,, ♏iv.	— ♏vi.
32.	Juniperi spiritus	,, ʒiss.	— ʒj.
33.	Pareiræ decoctum	,, ℥i.	— ℥ii.
34.	,, extractum liquidum	,, ʒss.	— ʒii.
35.	Sabinæ pulvis	,, gr. iv.	— gr. x.
36.	Sabinæ oleum	,, ♏i.	— ♏iii.
37.	Sabinæ tinctura	,, ♏xx.	— ʒi.
38.	Sapo durus et mollis	,, gr. x.	— gr. xx.
39.	Scillæ pulvis	,, gr. v.	— gr. xx.
40.	Scillæ syrupus	,, ʒi.	— ʒii.
41.	Scillæ tinctura	,, ♏xv.	— ʒi.

42. Scillæ pilula composita	dose gr. v.	to gr. x.
43. Scoparii succus	„ ʒss.	— ʒij.
44. Senegæ decoctum	„ ℥i.	— ℥ii.
45. Taraxaci decoctum	„ ℥i.	— ℥ii.
46. Taraxaci extractum	„ gr. x.	— gr. xxx.
47. Taraxaci succus	„ ʒi.	— ʒiv.
48. Terebinthina Canadensis	„ gr. x.	— gr. xl.
49. Terebinthinæ oleum	„ ʒss.	— ʒii.
50. Terebinthinæ confectio	„ gr. lx.	— gr. cl.
51. Uvæ ursi infusum	„ ℥i.	— ℥ii.

(*c.*) *Animal.*

52. Cantharidis tinctura	dose ♏v.	— ♏xx.

Diuretics in the form of Draught, &c.

293. ℞. Ammoniæ benzoatis gr. x.
Ext. pareiræ liquidi ʒj.
Decocti pareiræ ℥iss. M.

294. ℞. Lithiæ citratis gr. x.
Acidi citrici gr. xx.
Syrupi aurantii ʒss.
Aquæ f ℥ii. Solve.
To be taken in a state of effervescence with gr. xiv. bicarbonate of soda dissolved in f ℥ii. water.

295. ℞. Potassæ nitratis gr. xv.
Potassæ bicarbonatis gr. xxx.
Spiritûs juniperi ʒss.
Infusi buchu ℥iss. M.

296. ℞. Potassæ nitratis ℥ss.
Dissolve in a quart of lemonade for a common drink.

297. ℞. Potassæ acetatis gr. xl.
Infusi digitalis ʒii.
Sp. ætheris nitrosi ʒj.
Decocti taraxaci ℥iss.ft. H.

298. ℞. Potassæ tartratis acidæ ℥ss.
Corticis limonis, et sacchari q. s.
Aquæ ferventis Oii.
(For a common drink.)

299. ℞. Sodæ et potas. tart. gr. lx.
Spiritûs juniperi ʒj.
Succi scoparii ʒss.
Decocti taraxaci ℥iss. M.

300. ℞. Copaibæ ʒss.
Vitelli ovi. q. s.
Sacchari ʒj.
Aquæ menthæ virid. ℥iss.
M. fiat emulsio.

301. ℞. Infusi buchu ℥iss.
Spiritûs juniperi c. ʒi.

302. ℞. Taraxaci succi.
Spiritûs juniperi ana ʒj.
Tincturæ scillæ ʒss.
Decocti scoparii ℥iss. M.

303. ℞. Sabinæ tincturæ ʒss.
Infusi buchu ℥iss. M.

304. ℞. Acidi nitrici diluti ♏x.
Tinct. hyoscyami ʒss. M.
Decocti pareiræ ℥iss.

305. ℞. Tincturæ cantharidis ♏x.
Spiritûs juniperi ʒj.
Decocti pareiræ ℥iss. M.

306. ℞. Træ. seminis colchici ʒss.
Potassæ acetatis gr. lx.
Aquæ fœniculi ℥iss. M.

Diuretics in the form of Pill, Powder, &c.

307. ℞. Pilulæ scillæ compositæ gr. x.
Calomelanos gr. $\frac{1}{4}$.
Olei juniperi ♏j.
Fiant pilulæ duæ.

308. ℞. Pulvis digitalis gr. i.—ii.
Hydrargyri pilulæ gr. ii.
Pilulæ scillæ co. gr. vi.
M. Et in pilulas ii. divide.

309. ℞. Digitalini gr. $\frac{1}{60}$.
Pulvis scillæ.
Extracti taraxaci ana gr. v.
Misce et ft. pil. ii.

310. ℞. Potassæ nitratis gr. x.
Potassæ tart. acidæ gr. xx.
Fiat pulvis.

311. ℞. Olei cubebæ ♏xx.
Saponis duri gr. x.
Pulvis glycyrrh. q. s. ut fiant boli duo.

312. ℞. Terebinthinæ Canadensis gr. v.
Olei cubebæ, ♏i.
Pulvis glycyrrhizæ, q. s. fiat bolus.

313. ℞. Extracti taraxaci ℥ss.
Pulvis scillæ gr. xl.
Confec. terebinthinæ ℥ss.
Succi taraxaci, q. s. fiat electuarium.

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18. ANTHELMINTICS.

Preparations of the London Pharmacopœia.

1. Calcis liquor (as an enema)	dose	℥ii.	to ℥iv.
2. Cusso infusum	,,	℥iv.	— ℥viii.
3. Filicis extractum liquidum	,,	ʒi.	— ʒiii.
4. Filicis maris pulvis	,,	gr. xx.	— gr. c.
5. Granati corticis decoctum	,,	℥ii.	— ℥x.
6. Granati corticis pulvis	,,	gr. xx.	— gr. c.
7. Kamela	,,	gr. xxx.	— gr. c.
8. Mucuna pruriens (*non-officinal*)	,,	gr. xx.	— ℥ss.
9. Pulvis scammonii compositus	,,	gr. v.	— gr. xx.
10. Quassiæ infusum (as an enema)	,,	℥ii.	— ℥iv.
11. Santoninum	,,	gr. i.	— gr. vi.
12. Spigeliæ Marylandicæ radicis pulvis (*non-officinal*)	,,	gr. l.	— gr. c.
13. Terebinthinæ oleum	,,	℥ss.	— ℥ii.

314. ℞. Olei terebinthinæ ʒi.
Decocti hordei ℥i. M. ft. h.

315. ℞. Mucunæ prurientis gr. c.
Theriacæ ℥i. M.
(A tea-spoonful for a dose.)

316. ℞. Extracti filicis liquidi ʒi.
Pulv. tragacanthæ comp. gr. l.
Aq. menthæ piperitæ ℥ii.
Fiat haustus.

317. ℞. Santonini gr. ii.
Pulv. scammonii comp. gr. viii.
Fiat pulvis.

19. EMMENAGOGUES.

1. Rutæ oleum	dose ♏ii. to ♏v.
2. Sabinæ oleum	,, ♏i. — ♏v.
3. Sabinæ tincturæ	,, ♏x. — ʒi.

For the other remedies of this class, see Tonics, especially those containing steel, myrrh, and aloes.

318. ℞. Ferri et ammon. cit. gr. x.
Tincturæ sabinæ ♏xx.
Aqua cinnamomi ℥iss. M.

319. ℞. Olei rutæ ♏iv.
Pulveris myrrhæ gr. iv.
Pulvis aloes gr. ii.
Fiant pilulæ duæ.

320. ℞. Olei sabinæ ♏iv.
Pulvis myrrhæ gr. v.
Saponis mollis q. s.
Fiant pilulæ duæ.

20. ANTACIDS.

1. Ammoniæ liquor, acetas, carbonas, benzoas, phosphas.
2. Ammoniæ spiritus aromaticus.
3. Guaiaci tinctura ammoniata.
4. Valerianæ tinctura ammoniata.
5. Calcis liquor, liquor saccharatus; calx carbonas precipitata;
,, ,, chlorinata; creta preparata.
6. —— mistura cretæ.
7. —— pulvis cretæ aromaticus.
8. —— pulvis cretæ aromaticus cum opio.
9. Lithiæ, carbonas, citras.
10. Potassæ liquor; acetas; carbonas; bicarbonas; citras; tartras; tartras acida.
11. Sodæ liquor; carbonas; carbonas exsiccata; bicarbonas; sodæ et potassæ tartras; citro-tartras effervescens.
12. Magnesia; magnesia levis; magnesiæ carbonas; carbonas levis.
13. Pulvis rhei compositus.
14. Sapo mollis, durus.

(For Formulæ, see Diuretics, &c.)

21. ANTISEPTICS AND DISINFECTANTS.

1. Acidum aceticum.
2. Acidium carbolicium, dose gr. i. to gr. iii.
3. ,, ,, glycyrinum gr. iv.—gr. xii.
4. Carbo.
5. Carbo animalis.
6. Cataplasma carbonis, fermenti, sodæ chlorinatæ.

7. Kreasotum.
8. Liquor calcis chlorinatæ.
9. Liquor chlorinii.
10. Liquor sodæ chlorinatæ.
11. Pix liquida.
12. Potassæ permanganatis liquor.
13. Zinci chloridum.

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22. ALTERATIVES.

1. Acidum nitro-hydrochloricum dilutum; acidum arseniosum (dose $\frac{1}{20}$ to $\frac{1}{10}$ gr.); liquor arsenicalis (dose ♏ii. to ♏x.); liquor arsenici hydrochloricus (dose ♏ii.—♏viii.); liquor sodæ arseniatis (dose ♏v. to ♏x.).
2. Antimonium sulphuratum; antimonium tartaratum; vinum antimoniale (gr. $\frac{1}{4}$ in ʒi.); antimonii oxidum (dose gr. i. to gr. v.); pulvis antimonialis gr. v. to gr. x.
3. Brominium (dose $\frac{1}{2}$ to gr. ii.). Potassii bromidi (dose gr. iii. to gr. xxx.).
4. Dulcamaræ infusum ℥j.—℥ii.
5. Ferri arsenias (dose gr. $\frac{1}{16}$—gr. $\frac{1}{2}$).
6. Ferri iodidum (gr. i. to gr. x.); syrupus ferri iodidi (gr. ivss. in ʒi.); pilula ferri iodidi (dose gr. v. to gr. x.).
7. Hemidesmi syrupus ʒj.
8. Hydrargyrum cum cretâ (dose gr. iii. to gr. viii.); H. perchloridum (dose gr. $\frac{1}{16}$ to gr. $\frac{1}{4}$).
9. Hydrargyri iodidum rubrum (dose gr. $\frac{1}{16}$ to gr. $\frac{1}{4}$);—iodidum viride (dose gr. i. to gr. iii.);—oxidum rubrum; pilula; linimentum; unguentum; unguentum hydrargyri ammoniati; unguentum hydrargyri iodidi rubri; unguentum hydrargyri nitratis; unguentum hydrargyri oxidi rubri; hydrargyri emplastrum; emplastrum ammoniaci cum hydrargyro. Calomelas (dose gr. $\frac{1}{4}$ to gr. ii.), pilula calomelanos composita, unguentum calomelanos.
10. Iodinii; tinctura (dose ♏v. to ♏xxx.); linimentum; unguentum compositum, linimentum.
11. Potassii iodidi (gr. i. to gr. x.); emplastrum; unguentum; unguentum iodinii compositum; tinctura iodinii; linimentum iodinii.
12. Morrhuæ oleum.
13. Sarsæ decoctum; decoctum compositum; extractum liquidum.

Alteratives in the form of Draught.

321. ℞. Liq. hydrarg. perchloridi ʒj.
Tincturæ chloroformi co. ʒss.
Aquæ menthæ pip. ℥iss. M.

322. ℞. Potassii iodidi gr. v.
Infusi aurantii ℥iss. Ft. h.

323. ℞. Syrupi ferri iodidi ʒj.
Decocti sarsæ co. ℥iss. Ft. h.

324. ℞. Potassii bromidi gr. x.
Infusi dulcamaræ ℥iss.
Fiat h.

325. ℞. Dec. sarsæ comp. ℥iss.
Acidi nitrici hydrochlorici diluti ♏x. Ft. h.

326. ℞. Liquoris arsenicalis ♏v.
Tinct. chlorof. co. ♏xx.
Infusi aurantii ℥iss. Ft. h.

327. ℞. Liq. sodæ arseniatis ♏v.
Sodæ bicarbonatis gr. lx.
Aq. pimentæ ℥iss. Ft. h.

328. ℞. Liq. arsenici hydrochlorici ♏iii.
Syrupi hemidesemi ʒj.
Aquæ anethi ℥iss. Ft. h.

Alteratives in the form of Pill.

329. ℞. Calomelanos gr. iii.
Pil. saponis comp. gr. xviii.
Ft. pil. xii. One every two, three, or four hours.

330. ℞. Hydrarg. iodidi rubri gr. i.
Extracti sarsæ ʒj.
Fiant pil. xii. (One for a dose.)

Alteratives in the form of Powder.

331. ℞. Hydrarg. c. cretâ gr. xx.
Antimonii tartarati gr. i.
Sacchari gr. lx.
Fiant pulveres decem. (One for a dose.)

332. ℞. Calomelanos gr. iii.
Pulvis opii gr. i.
Pulvis glycyrrhizæ gr. lx.
Fiant pulveres decem. (One for a dose.)

333. ℞. Hydrarg. c. cretâ gr. i.
Sacchari albi gr. v.
Fiat pulvis.

334. ℞. Ferri arseniatis gr. i.
Pulvis cinnam. co. gr. lx.
Fiant pulv. decem. (One for a dose.)

Alteratives in the form of Bath.

335. ℞. Potassii sulphidi ℥x.
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Diphtheria, *æ*, *f.* (διφθερόω, to cover with skin), 325.
Dropsy. (ὕδρωψ, fr. ὕδωρ, water) 270.
Dysentery, *Dysenteria*, *æ*, *f.* (δὺς, with difficulty, ἔντερον, the bowels), 509.
Dysmenorrhœa, *æ*, *f.* (δὺς, difficult, μὴν, a month, ῥέω, to flow), 565.
Dyspepsia, *æ*, *f.* (δὺς, difficult, πέπτω, to concoct), 500.
Dysphonia, *æ*, *f.* (δὺς, difficult, φωνὴ, voice), 494.
Dyspnœa, *æ*, *f.* (δὺς, with difficulty, πνέω, to breathe), 186.
Dysuria, *æ*, *f.* (δὺς, with difficulty, οὐρέω, to pass urine), 562.

Ecthyma, *ătis*, *n.* Cutaneous pustules (ἐκθύω, to break out), 630.
Eczema, *ătis*, *n.* Running scab (ἐκζέω, to boil up), 624.
Electrode. (ἤλεκτρον, amber, ὁδὸς, a way), 394.
Elephantiasis, *is*, *f.* (ἐλεφαντίασις, fr. ἐλέφας, an elephant), 637.
Embolism, *Embolismus*, *i*, *m.* (fr. ἐμβάλλω, to drive in), 442.
Emphysema, *ătis*, *n.* (ἐμφύσημα, fr. ἐμφυσάω, to inflate), 464.
Emprosthotonos, *adj.* (ἔμπροσθεν, forwards, τείνω, to bend), bent forwards, 410.
Empyema, *ătis*, *n.* Pus (ἐν, within, πύον, pus), 482.
Emunctory, *Emunctorium*, *i*, *n.* (fr. *emungo*, to carry off), 70.
Encephalitis, *ĭdis*, *f.* (ἐν, in, κεφαλὴ, head, *itis*), 364.

Endemic. Indigenous (ἐν, among, δῆμος, a people; or, ἐν, in, δῆμος, a district), 296, 553, 559.
Endocarditis, *ĭdis, f.* (ἔνδον, within, καρδία, the heart, *itis*), 430.
Enteritis, *ĭdis, f.* (ἔντερον, the bowels, *itis*), 508.
Entozoa, *pl.*, *Entozoon, i, n.* (ἐντὸς. within, ζῶον, an animal), 643.
Enuresis, *is, f.* Incontinence of urine (ἐν, in, οὐρέω, to pass urine), 561.
Ephelis, *ĭdis, f.* Freckles (ἐφηλὶς, fr. ἐπὶ and ἥλιος, the sun), 640.
Epidermmycosis, *is, f.*, contraction for epidermato-mycosis. (fr. ἐπιδερμὶς, the cuticle, μύκης, a fungus), 613.
Epidemic. Prevalent (ἐπὶ, among, δῆμος, a people), 455.
Epilepsy. Falling sickness (ἐπιληψία; ἐπιλαμβάνω, to seize upon), 402.
Equinia, *æ, f.* Glanders (*equus*, a horse), 341.
Erysipelas, *ătis, n.* (ἐρυσίπελας, fr. ἐρύω, to draw, πέλας, near), 273.
Erythema, *ătis, n.* Inflammatory blush (ἐρυθαίνω, to redden), 621.
Exanthemata, *pl.*, *Exanthema, ătis, n.* (ἐξανθέω, to break out into red spots), 307.

Febricula, *æ, f.* (dim. of *febris*), 265.
Febris, *is, f.* (*ferveo*, to be hot,) 277.
Frambœsia, *æ, f.* The yaws (*framboise*, Fr., a raspberry), 638.

Gangræna, *æ, f.* (γάγγραινα, fr. γράω, to eat), 66.
Gastralgia, *æ, f.* Pain in the stomach (γαστὴρ, the stomach, ἄλγος, pain), 499.
Gastritis, *idis, f.* (γαστὴρ, the stomach, *itis*), 499.
Gastrodynia. (γαστὴρ, the stomach, ὀδύνη, pain, *itis*), 501.
Gastro-enteritis, *idis, f.* (γαστὴρ, the stomach, ἔντερον, the bowels, *itis*), 519.
Gingivitis, *ĭdis, f.* (*gingivæ*, the gums, *itis*), 491.
Glaucoma, *atis, n.* (fr. γλαυκὸς, sea-green), 602.
Glossitis, *ĭdis, f.* (γλῶσσα, the tongue, *itis*), 491.
Gonorrhœa, *æ, f.* (γονὴ, seed, ῥέω, to flow), 577.

Hæmatemesis, *is, f.* (αἷμα, blood, ἔμεσις, vomiting), 498.
Hæmaturia, *æ, f.* Bloody urine (αἷμα, blood, οὐρέω, to void urine), 552.
Hæmoptysis, *is, f.* Spitting of blood (αἷμα, blood, πτύσις, spitting), 471.
Hæmorrhage. Bleeding (αἷμα. blood, ῥήγνυμι, to burst forth), 270.
Hæmorrhois, *ĭdis, f.* (αἷμα, blood, ῥέω, to flow), 518.
Hectic. A remittent fever (ἑκτικὸς, habitual), 331.
Hemiplegia, *æ, f.* Palsy of one side (ἥμισυς, half, πλήσσω, to strike), 390.
Hepatitis, *ĭdis, f.* (ἧπαρ, ἥπατος, the liver, *itis*), 529.
Herpes, *ētis, m.* Tetter (ἕρπω, to creep), 626.
Homologous. (ὁμὸς, like, λόγος, condition), 85.
Hydatid. (ὑδατὶς, ίδος, ἡ, a small bladder, fr. ὕδωρ), 438, 540.
Hydrocephalus, *i, m.* (ὕδωρ, water, κεφαλὴ, head), 371.

Hydropericardium, *i*, *n*. (*ὕδωρ*, water, *περὶ*, around, *καρδία*, the heart), 429.

Hydrophobia, *æ*, *f*. Canine madness (*ὕδωρ*, water, *φόβος*, fear), 413.

Hydrops, *ōpis*, *m*. (fr. *ὕδωρ*, water), 270.

Hydrorachis, *eos*, *f*. (*ὕδωρ*, water, *ῥάχις*, the spine), 380.

Hydrothorax, *ācis*, *f*. (*ὕδωρ*, water, *θώραξ*, the chest), 482.

Hyperæmia. (*ὑπὲρ*, excess, *αἷμα*, blood), 256.

Hyperæsthesia. (*ὑπὲρ*, excess, *αἴσθησις*, sensation), 101.

Hypertrophy. (*ὑπὲρ*, over, *τροφὴ*, nourishment), 81.

Hypnotic, *hypnŏtĭcus*, *a*, *m*. (*ὕπνος*, sleep, sleep inducing), 248.

Hypochondriasis, *is*, *m*. Low spirits (*ὑπὸ*, under, *χόνδρος*, cartilage), 418.

Hysteralgia, *æ*, *f*. (*ὑστέρα*, the womb, *ἄλγος*, pain), 386

Hysteria, *æ*, *f*. Hysterics (*ὑστέρα*, the womb), 387, 407.

Hysteritis, *ĭdis*, *f*. (*ὑστέρα*, the womb, *itis*), 338, 568.

Icterus, *i*, *m*. Jaundice (*ἴκτερος*, a yellow bird), 536.

Idiosyncrasy (*ἴδιος*, peculiar, *σὺν*, with, *κρᾶσις*, temperament), 6.

Ichthyosis, *is*, *f*. Fish-skin (*ἰχθύα*, the scale of a fish), 637.

Impetigo, *inis*, *f*. Running tetter (Lat. *impetigo*, fr. *impeto*, to assail), 638.

Inflammation. (Lat. *inflammatio*, fr. *in* and *flamma*), 266.

Influenza, *æ*, *f*. Epidemic catarrh (fr. *influo*, to abound), 455.

Intus-susceptio, *ōnis*, *f*. (*intus*, within, and *susceptio*, a taking), 515.

Iritis, *ĭdis*, *f*. (*iris*, a rainbow, *itis*), 591.

Ischuria, *æ*, *f*. Suppression of urine (*ἰσχουρία*, fr. *ἴσχω*, to restrain, *οὐρὸν*, urine), 555.

Itis. (*ἵημι*, to urge against, thus denoting violent action, and used as a terminal to indicate *inflammation*), 22.

Kyestein. (*κύησις*, *εως*, *ἡ*, pregnancy, *ἐσθὴς*, *ῆτος*, *ἡ*, a covering), 134.

Laryngismus, *i*, *m*. (*λαρυγγίζω*, to vociferate), 453.

Laryngitis, *ĭdis*, *f*. (*λάρυγξ*, the larynx, *itis*), 446.

Lepra. A cutaneous disease (*λεπρὸς*, scaly), 637.

Leucocythemia, *æ*. *f*. (*λευκὸς*, white, *κύτος*, a cell, and *αἷμα*, blood), 262.

Leucorrhœa, *æ*, *f*. The whites (*λευκὸς*, white, *ῥέω*, to flow), 566.

Lichen, *ēnis*, *n*. A cutaneous disease (*λειχὴν*, a lichen), 633.

Lumbago, *inis*, *f*. (*lumbus*, the loins), 357.

Lumbricus, *i*. *m*. (Ascaris lumbricoides) round worm (*lubricus*, slippery), 643.

Lupus, *i*, *m*. (*lupus*, a wolf), 640.

Mania, *æ*, *f*. (*μαίνομαι*, to be furious), 118, 415.

Marasmus, *i*, *m*. Atrophy (*μαραίνω*, to wither), 525.

Melancholia, *æ*, *f*. (*μέλαινα*, black, *χολὴ*, bile), 118, 417.

Melæna, *æ*, *f*. Hæmorrhage from the bowels (*μέλαινα*, black), 497.

Melanosis, *is*, *f*. A morbid product of a black colour (*μέλας*. *μέλανος*, black), 87.

Melasma, *ătis*, *n.* (fr. *μέλας*, black), 263.
Meningitis, *ĭdis*, *f.* (*μῆνιγξ*, a membrane, *itis*), 370.
Menorrhagia, *æ*, *f.* Flooding (*μὴν*, a month, *ῥήγνυμι*, to break forth), 565.
Mentagra, *æ*, *f.* (*mentum*, the chin, *ἄγρα*, seizure), 616.
Metritis, *ĭdis*, *f.* Inflammation of the womb (*μήτρα*, the womb, *itis*), 338, 568.
Miliaria, *æ*, *f.* Miliary fever (*milium*, a millet seed), 627.
Mimōsis, *is*, *f.* (*μῖμος*, a mimic), 264.
Mollities, *ei*, *f.* (Softening, fr. *mollis*, soft), 348.
Molluscum, *i*, *n.* (*molluscum*, the bunch of the tree acer), 639.
Myelitis, *ĭdis*, *f.* Inflammation of the spinal cord (*μυελὸς*, marrow, *itis*), 380.

Narcotic, *narcōtĭcus*, *a*, *m.* (*ναρκόω*, to stupify), 243, 248.
Nephritis, *ĭdis*, *f.* (*νεφρὸς*, the kidney, *itis*), 543.
Neuralgia, *æ*, *f.* (*νεῦρον*, a nerve, *ἄλγος*, pain), 385.
Noseræsthesia. Morbid sensation (*νοσηρὸς*, unhealthy, *αἴσθησις*, sensation), 101.

Œdēma, *ătis*, *n.* (*οἰδέω*, to swell), 270.
Œsophagitis, *ĭdis*, *f.* (*οἴσω*, to carry, *φάγω*, to eat, *itis*), 496.
Oophoritis, *Oŏphorum*, *i*, *n.*, an ovary (*ὠὸν*, an egg, *φέρω*, to bear, *itis*), 575.
Ophthalmia, *æ*, *f.* Inflammation of the eye (*ὀφθαλμὸς*, the eye), 585.
Opisthotonos *adj.* (*ὄπισθε*, at the back, *τείνω*, to bend), bent backwards, 410.
Osteo-malacia, *æ*, *f.* (*ὀστέον*, a bone, *μαλακία*, softness), 348.
Otitis, *ĭdis*, *f.* (*οὖς*, *ὠτὸς*, the ear, *itis*), 605.

Palpitatio, *ōnis*, *f.* (*palpito*, to throb), 421.
Paracentesis, *is*, f. Tapping (*παρὰ*, through, *κεντέω*, to pierce), 375.
Paralysis, *is*, *f.* Palsy (*παραλύω*, to relax), 390.
Paraplegia, *æ*, *f.* Palsy of the lower half of the body (*παραπλήσσω*, to strike), 392, 441.
Parotitis, *idis*, *f.* (*παρὰ*, near, *ὠτὸς*, of the ear), 494.
Pellagra, *æ*, *f.* (*pellis agria*, wild skin; or *φελλὸς*, the bark of the cork-tree, and *ἄγριος*, wild), 636.
Pemphigus, *i*, *m.* (*πέμφιγος*, of a small blister), 628.
Pericarditis, *ĭdis*, *f.* (*περὶ*, around, *καρδία*, the heart, *itis*), 426.
Peritonitis, *ĭdis*, *f.* (*περιτόναιον*, fr. *περὶ*, around, *τείνω*, to extend, *itis*), 524.
Pertussis, *is*, *f.* Whooping-cough (*pertussis*, a continual cough), 465.
Pestis, *is*, *f.* The plague (Lat. *pestis*), 328.
Pĕtĕchiæ, *a*, *æ*, *f.* (*petĕchio*, a flea bite), small purple spots, 349.
Phlebitis, *ĭdis*, *f.* Inflammation of the veins (*φλὲψ*, *φλεβὸς*, a vein), 443.
Phlegmasia, *æ*, *f.* (*φλέγμα*, a burning, fr. *φλέγω*, to burn), 445.
Phlegmon. *Phlegmŏnē*, *es*, *f.* (fr. *φλέγω*, to burn), 40.

Phlogosis, *is, f.* (*φλόγωσις*, a burning, *φλογόω*, to inflame), 266.
Phrenitis, *idis, f.* (*φρὴν, φρενὸς*, the mind, *itis*), 364.
Phthisis, *is, f.* Consumption (*φθίσις*, fr. *φθίω*, to consume), 473.
Pityriasis, *is, f.* Dandriff (*πίτυρον*, bran), 611.
Plethora. Fulness of blood (*πληθώρα*, fulness), 256.
Pleuritis, *ĭdis, f.* Inflammation of the pleura (*πλευρὰ*, the side), 480.
Pleurodyne. (*πλευρὰ*, the side, *ὀδύνη*, pain), 356.
Pleurosthotonos, *adj.* (*πλευρόθεν*, from one side, *τείνω*, to bend), bent sideways, 410.
Pneumonia, *æ, f.* Inflammation of the substance of the lungs (*πνεύμων*, the lung), 468.
Pneumothorax, *ācis, f.* Air in the pleura (*πνεῦμα*, air, *θώραξ*, the chest), 484.
Podagra, *æ, f.* Gout (*ποδὸς*, of a foot, *ἄγρα*, seizure), 357.
Polyæmia, *æ, f.* (*πολὺς*, much, *αἷμα*, blood), 256.
Polypus, *i, m.* (*πολὺς*, many, *ποὺς*, a foot), 571.
Porrigo, *ĭnis, m.* and *f.* (*porrum*, a leak), 615.
Prurigo, *ĭnis, f.*, Pruritus. (*prurigo*, itching, *prurio*, to itch), 634.
Psora, *æ, f.* The itch (*ψώρα*), 610.
Psoriasis, *is, f.* Dry scall (*ψώρα*, the itch), 635.
Ptosis, *is, f.* (fr. *πτόω*, to fall), 398.
Puerperal. (*puer*, a boy, *pario*, to bring forth), 336.
Purpura, *æ, f.* Scurvy (*purpura*, a shell-fish yielding a purple dye), 349.
Pyæmia, *æ, f.* (*πύον*, pus, *αἷμα*, blood), 334, 497.
Pyogenic. (*pyogenicus, a, um*, fr. *πύον*, pus, *γεννάω*, to form), 334.
Pyrexia, *æ, f.* Fever (*πύρεξις*, fr. *πῦρ*; *ἔχω*, to hold), 266.
Pyrosis, *is, f.* Water-brash (*πύρωσις*, burning), 506.

Quinsy. (*cynanche*, fr. *κύων*, a dog, *ἄγχω*, to strangle), 492.

Rachitis, *ĭdis, f.* Rickets (*ῥάχις*, the back), 346.
Retinitis, *ĭdis, f.* Inflammation of the retina (*rete*, a net and *itis*), 596.
Rheumatism, *Rheumatismus, i, m.* (fr. *ῥεῦμα*, a fluxion), 352.
Rubeola, *æ, f.* Measles (*rubeo*, to be red), 316.
Rupia, *æ, f.* A cutaneous disease (*ῥύπος*, filth), 629.

Scabies, *ei, f.* The itch (*scabies*, fr. *scabo*, to scratch), 610.
Scarlatina, *adj., us, a, um.* Febris understood, 319.
Sciatica, *æ, f.* Pain in the hip (*ἰσχιὰς*, fr. *ἴσχιον*, the hip), 388.
Sclerotitis, *ĭdis, f.* (*σκληρὸς*, hard, and *itis*), 589.
Scorbutus, *i, m.* Scurvy (Lat. *scorbutus*), 350.
Scrofula, *æ, f.* King's evil (*scrofula*, a little pig). 4. 344, 588.
Scybala, *plur.*, hard fæces. (*σκύβαλον, ου, τὸ*, dung). 515.
Septicæmia, *æ, f.* (fr. *σήπω*, to putrefy, *αἷμα*, the blood). 334.
Spermatorrhœa, *æ, f.* (*σπέρμα*, seed, *ῥέω*, to flow). 583.
Splenitis, *ĭdis, f.* Inflammation of the spleen (*σπλὴν*, the spleen, *itis*), 542.

Stomatitis, *ĭdis*, *f.* Inflammation of the mouth (*στόμα*, the mouth, *itis*), 485.
Stridulus, *a*, *um.* Creaking, 453.
Struma, *pl. us*, *i*, *m* . King's evil (*στρῶμα*, a heaping up), 4, 344.
Sycosis, *is*, *f.* Chin-welk (*συκόω*, to convert into a fig), 616.
Syncope, *es*, *f.* Fainting (*συγκόπτω*, to cut down), 424.
Syphilis, *ĭdis*, *f.* (fr. *σὺν*, together, *φιλέω*, to love), 578.

Tabes (*is*, *f.*) mesenterica. (*tabes*, a consumption, *μεσεντέριον*, the mesentery), 400, 525.
Tænia, *æ*, *f.* Tape-worm (*tænia*, a riband, from *τείνω*, to stretch), 648.
Tetanus, *i*, *m.* Locked jaw (*τείνω*, to stretch), 410.
Thrombosis, *is*, *f.* (fr. *θρόμβος*, a clot of blood), 442.
Tic doloreux. (Fr. *tic*, a convulsive motion, *doloreux*, painful), 386.
Tonic, *tonicus*, *a*, *m.* (fr. *τείνω*, to tighten), 241.
Tonsillitis, *ĭdis*, *f.* (*tondeo*, to clip? and *itis*), 492.
Tormina, *en*, *ĭnis*, *n.* (fr. *torqueo*, to rack), griping pains, 515.
Tracheitis, *ĭdis*, *f.* (*τραχεῖα ἀρτηρία*, rough artery, *itis*), 452.
Trismus, *i. m.* Locked jaw (*τρισμὸς*, fr. *τρίζω*, to gnash the teeth), 410.
Tympanites, *æ*, *m.* Drum-belly (*τυμπανοειδὴς*, like a drum), 518.
Typhoid. (*typhus*, and *εἶδος*, like), 296.
Typhous. (*typhosus*, pertaining to typhus), 291.
Typhus, *i*, *m.* (*τυφὸς*, fr. *τυφόω*, to stupefy), 288.

Urticaria, *æ*, *f.* Nettle-rash (*urtica*, a nettle), 622.

Vaccina, *æ*, *f.* Cow-pox (*vaccinus*, belonging to a cow), 313.
Varicella, *æ*, *f.* Chicken-pox (dim. of *varus*, a spot), 315.
Variola, *æ*, *f.* Small-pox (dim. of *varus*, a spot), 307.
Varioloid. (variola, small-pox, *εἶδος*, like), 580.
Vibices, *vibex*, *īcis.* (f. purple blotches of the skin), 295.

Zymotic. Contagious and infectious diseases (*ζύμωσις*, fermentation, fr. *ζυμόω*, to ferment). An inappropriate term. 21.

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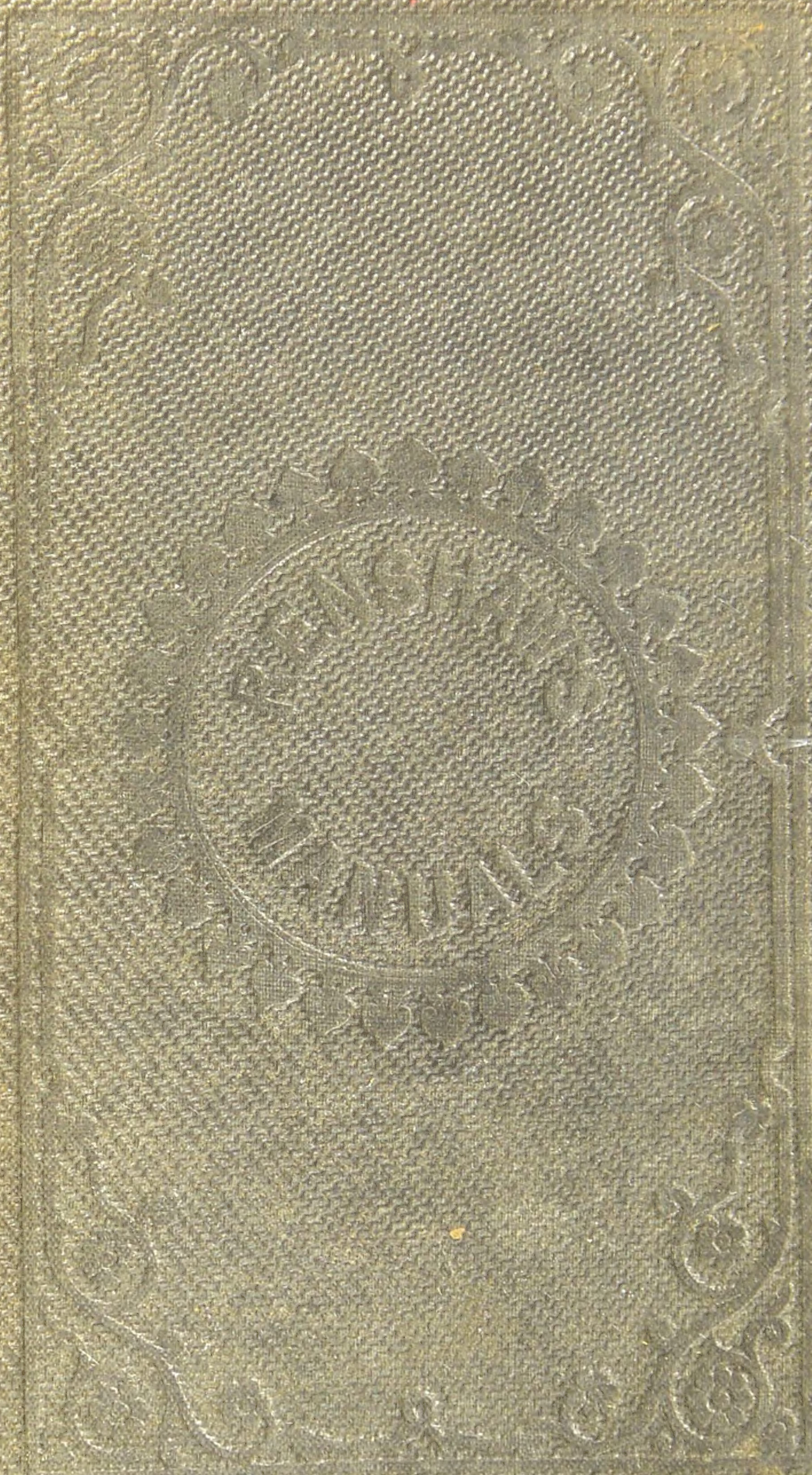
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